Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Vol. 13 No. 8 *August 1960*

Fish and Wildlife Service
U.S. Department of the Interior
Washington D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
ARNIE J. SUOMELA, COMMISSIONER

Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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0 General and theoretical
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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.31 ISOLATION OF PREGN-4-ENE-17α, 20β-DIOL-3-ONE FROM THE PLASMA OF PACIFIC SALMON (ONCORHYNCHUS NERKA)

Idler, D. R.; Fagerlund, U. H. M.; and Ronald, A. P. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Biochemical and Biophysical Research Communications 2, 133-137 (February 1960)

Idler et al. (1959) isolated cortisol, cortisone, and 17-hydroxyprogesterone from salmon plasma and reported that the first two compounds were at a high level in the blood, particularly in fish that had spawned. They found three ultraviolet absorbing substances that are less polar than corticosterone. Fraction 6B, the substance of intermediate polarity when chromatographed in heptane:benzene 1:1-formamide (HBF), was 17-hydroxyprogesterone.

Fraction 6A, which is the most polar of the three steroids, has now been identified as pregn-4-ene-17α, 20β-diol-3-one. To the authors' knowledge this represents the first reported isolation of this steriod from a natural source.

Experimental. -- The blood was collected from 80 post-spawned female sockeye. Plasma was prepared from the heparinized blood and frozen on dry ice. The thawed plasma was extracted three times with 2.5 volumes of CH_2Cl_2. The chilled extract was washed with 0.05 NaOH, 0.1 N acetic acid, and water. The CH_2Cl_2 was removed at 30° under vacuum. The residue was taken up on 70 percent methanol, and the nonsteroid fatty material was removed by partition with hexane.

The C-20 epimers of pregn-4-ene-17α, 20-diol-3-one were located on paper chromatograms, prepared by selective reduction with $NaBH_4$ of the C-20 ketone of chromatographically pure 17α-hydroxyprogesterone. The 20α-epimer also was prepared by microbiological reduction of 17α-hydroxyprogesterone with Rhodotorula longissima. Infrared spectra of micro KBr pellets containing 20 to 5 μg. of steroid were recorded using a Beckmann IR-4 equipped with a beam-condensing system.

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 ABSTRACTER: Kathryn L. Osterhaug

0.32 ON LIGHT-SCATTERING STUDIES OF ISOIONIC PROTEINS

Timasheff, Serge N. and Coleman, Bernard D.
Archives of Biochemistry and Biophysics 87, 63-69 (March 1960)

The purpose of this paper is to show that the attractive force that results from charge fluctuations can be used in certain cases to explain the negative sign of the coefficient (C_2) that is observed in light-scattering studies on isoionic proteins in the presence of neutral salts. Light-scattering is a standard technique for studies of the sizes, shapes, and degrees of aggregation of natural and synthetic polymers.

Protein-protein interaction is represented by A_{22}, which is composed of contributions from several attractive and repulsive forces. These include: (a) positive contribution of the excluded volume; (b) positive contribution of the electrostatic repulsion due to the net charge of the protein; (c) negative contribution of the dipole and multipole interactions; (d) effect of various nonelectrostatic forces; and (e) an additional attractive force that acts in the system as a result of fluctuations in charge and charge configuration on a protein molecule. The fluctuating charge contribution to A_{22} in the presence of a neutral salt is A_{22}^e and is calculated by the following equation (see over): where m_j is the molar concentration of added electrolyte, b is the radius of the protein molecule, and v_i is the number of moles of the i'th ionic species associated with each mole of protein in Scathard's method of defining components (J. Am. Chem. Soc. 68, 2315 (1946), C_2 is the concentration of the macromolecular species in grams per 3 ml., T is the thermodynamic temperature, M_2 is the molecular weight of the macromolecular species, N is Avogadro's number, R is the gas constant, μ_2 is the excess chemical potential of the macromolecular component, Z_2 is the average net charge of the protein, D is the dielectric constant of the medium, k and a are Debye-Huckel parameters, e is the protonic charge, G is repulsion, B_o reflects the contribution of the excluded volume effect to the second virial coefficient.

(over)

 ABSTRACTER: Neva L. Karrick

0.36 THE ROLE OF ACTIN IN MUSCLE TISSUE AND SOME QUESTIONS OF THE THEORY OF MUSCLE CONTRACTION

Zaalishvili, M. M. and Mikadze, G. V.
Biochemistry (U.S.S.R.) 24, 566-576 (July-August 1959)

The investigations of Evel'gardt and Lyubimova (1939 and 1941) demonstrated that the reaction of myosin with adenosine triphosphate lies at the base of the contraction of muscle. In 1942, these biochemists discovered actin. Most of the information accumulated in later years by the use of model systems indicates that adenosine triphosphate causes the contraction of actomyosin. The hypothesis has therefore arisen that actomyosin is a contractile substance and that the contraction of actomyosin fibers can be considered the analog of muscle contraction. In earlier experiments, actomyosin fibers were obtained by the method of Weber (1934). In more recent times, a process has been suggested for obtaining protein fibers by compressing a surface film of protein at high pressure. Hayashi (1951 and 1952) first studied actomyosin monolayer fibers and showed that in KCl solutions with an ionic strength of 0.05, 0.03 percent, adenosine triphosphate caused contraction of actomyosin fibers. In the present study, the authors present results that they obtained by investigating the contractile and mechanical properties of monolayer myosin and actomyosin fibers.

Obtaining fiber films. -- A Langmuir bath with dimensions of 100x15x1 cm. was used to obtain the fiber films. The bath gradually narrowed toward the center, and its width at the center was 3 cm. Movable barriers were placed at the two opposite ends, and the bath and movable barriers were covered with paraffin. The solution consisted of 0.5 M KCl in 0.02 M veronal-potassium that contained 10^{-4} $MgCl_2$. The protein solution was introduced onto the surface as a drop with a micropipette. After slowly drawing the barriers together for 5 minutes, the film was compressed into a fiber, which was removed from the bath with a dissecting needle after 2 minutes. The fiber was held at each end with small heart forceps that weighed 3 mg. each. The fibers obtained by this method were very strong and the average length was 18 to 22 mm. with a width of 0.7 mm.

The tensimeter. --The tensimeter used was constructed on the principle of a torsion balance.

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 ABSTRACTER: Kathryn L. Osterhaug

1.0143 ICELAND

Olafsson, David
Pacific Fisherman (International Yearbook Number) 58, 165-167 (January 25, 1960)

Iceland is situated between Greenland on the west and Norway on the east. The waters around Iceland are known to constitute some of the richest fishing grounds in the North Atlantic. During the 20th century Iceland has greatly increased her share of the fish catch in the Icelandic area and now is taking more than half the catch that is harvested from these waters.

During the past 30 years the Icelandic fishing fleet has been almost completely motorized. The number of fishermen is now well over 6,000. During the post-war years the fleet was almost completely reconstructed and, although the number of vessels was not increased, the total tonnage is about 125 percent larger than it was in the immediate prewar period. Most of the big deep-sea trawlers built immediately after the war were oil-burning steamships, but during the last few years the new vessels that were added to the fleet have all been diesel powered. Aside from the trawlers, the main bulk of the fleet is composed of motorboats, most of them in the size-range of 50 to 100 gross registered tons.

Catch, species, and processing. --For many decades, herring, and cod were the main species caught by Icelandic fishermen. Since 1950 the catch of ocean perch has been growing in importance.

The fisheries are highly seasonal. The main cod fisheries are conducted during the first 5 months of the year in areas around the south and west coasts of Iceland. From June to August the motor boats are engaged in the herring fishery off the north coast, and after this the fleet moves to the southwest coast and fishes for herring until December. For the trawlers, the ocean perch fishery

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 ABSTRACTER: Kathryn L. Osterhaug

STEROID FROM SALMON PLASMA

LIGHT-SCATTERING OF PROTEINS

THEORY OF MUSCLE CONTRACTION

ICELANDIC FISHERIES

0.32

In the calculation of A_{22}, it has been assumed that the near-balance between various short-range nonionic attractive and repulsive forces, which is reflected in low values of the coefficient C_2 in the absence of salt, is applicable in the presence of salt. In the presence of low concentrations of salt, good agreement was obtained between calculated and experimentally measured slopes. At high salt concentrations, the proteins acquire considerable net average charges due to chloride binding. This results in an additional positive contribution to A_{22} which can not be evaluated completely at this time.

Interactions between fluctuating multipole moments can make a significant contribution to excess chemical potential and may be partially responsible for the balancing that has been experimentally observed for various short-range attractive and repulsive forces for bovine serum albumin, bovine serum mercaptalbumin, and human serum mercaptalbumin and for the negative value of the coefficient of C_2 for conalbumin, which has been reported previously.

The authors give details of the calculations used for their theory and conclusions as well as 24 references.

(1) $$A_{22}^{e} = \frac{1}{RT}\left(\frac{\partial \mu_2^{(e)}}{\partial C_2}\right) = \frac{N}{M_2}\sum_{i=2}^{4} \nu_i G_{2i}$$

(2) $$G_{2i} = -\frac{4\pi e^2 \bar{Z}_2 Z_i}{DkT\kappa^2} + \frac{\pi e^4 \langle Z_2^2\rangle_{av} Z_i}{D^2k^2T^2\kappa(1+\kappa a)^2}$$

(3) $$A_{22}^{e} = 2B_0 - \frac{\pi N e^4 \langle Z_2^2\rangle_{av}^2}{M_2(DkT)^2\kappa(1+\kappa a)^2}$$

(4) $$\nu_2 = 1;\ \nu_3 = \left|\frac{\bar{Z}_2^2}{2}\right|;\ \nu_4 = -\left|\frac{\bar{Z}_2}{2}\right|;\ 2B_0 = \frac{7\pi N b^3}{6 M_2}$$

(5) $$\kappa^2 = \frac{4\pi N e^2}{DkT}\left(\frac{\sum_j m_j Z_j^2}{1000} + \frac{\langle Z_2^2\rangle_{av} + \bar{Z}_2^2}{M_2} C_2\right)$$

0.31

Results. --The new steroid had its max. at 240 mμ in methanol. It gave a negative test for the dehydroxyacetone side-chain (Silber and Porter 1954) and could be detected on paper chromatograms with a modified Zimmerman reagent (Bongiovanni et al. 1957). The unknown and synthetic pregn-4-ene-17α, 20β-diol-3-one both had an Rf relative to 17α-hydroxyprogesterone (R_{HP}) of 0.21 in HPG and 0.40 in HEG. The Rf of both substances was 0.18 in the HBF system.

The bismuthate oxidation products (Bush and Sandberg 1953) of the unknown and the synthetic 20β-epimer both had an Rf of 0.58 in BHMW identical to that of androst-4-ene-3,17-dione and all three compounds gave positive Zimmerman reactions.

The unknown and synthetic pregn-4-ene-17α, 20β-diol-3-one gave identical sulfuric acid chromogens with maxima and minima at 298 mμ and 238 mμ after 4 hours and 305 mμ and 242 mμ after 24 hours at room temperature.

The infrared spectrum of the unknown exhibited absorption maxima at 1612, 1660, 1333, 1263, 1231, 1183, 958, 943, 869, and 776 cm^{-1} characteristic of a Δ^4-3 ketone (Jones and Herling 1954). The absorption intensity at 3460 cm^{-1} indicated more than one OH group in the molecule. The spectrum corresponded in all respects with the published spectrum of pregn-r-ene-17α, 20β-diol-3-one (Dobriner et al. 1953) which was probably synthesized by the reduction of 17α-hydroxyprogesterone 3-benzylthioneol ether with $LiAlH_4$ (Romo et al. 1951). The infrared spectra of both products were identical with that of the synthetic 20β-epimer prepared by borohydride reduction of 17α-hydroxyprogesterone. The 20α-epimer preparations made by reduction of 17α-hydroxyprogesterone with $NaBH_4$ and with R. longissima gave identical infrared spectra that were quite distinct from the spectrum of the 20β-epimer.

From the free steroid extract of 1640 ml. of post-spawned female plasma 14.4 μg./100 ml. of 17-hydroxyprogesterone and 5.5 μg. per 100 ml. of the 20β-dihydro-epimer were recovered following chromatography in the HPG system. The concentration of 17-hydroxyprogesterone was comparable to that found previously by Idler et al. (1959) in plasma of pre-spawned females. Plasma levels of these steroids in the two sexes at various stages of the spawning migration will be the subject of a future report.

1.0143

starts immediately after the codfishing season and continues throughout the rest of the year. Some trawlers, however, may start codfishing during the last quarter of the year.

The processing of fish has undergone great changes during the past 20 years. The development of the demersal species has gone first from the salt fish to the fresh iced fish and then to the frozen fish. During the last few years the quick-freezing industry has become by far the most important branch of the Icelandic fish-processing industry, taking almost two-thirds of the total demersal catch.

From about 20 plants with a capacity of approximately 200 tons per 12-hour day in 1938 the number of plants has risen to 88 with a freezing capacity of approximately 1,000 tons. The freezing industry is modern and well equipped and complies with high sanitary standards.

The salting of cod and related species as well as the drying of stockfish still hold important positions in the processing industry even though the practice of salting fish has declined greatly.

Exports and markets. -- The fishing industry of Iceland is primarily an export industry. About 95 percent of the production is exported, therefore, the industry is entirely dependent on foreign markets. Fishery products constitute practically the sole export industry of Iceland. The following table gives the quantities of the main products exported in 1958 (in thousands of tons) and their percentage of the total export value.

	Per 1000 tons	Percent
Frozen fish	66	35
Dried salted fish	8	5
Wet salted fish	23	8
Stockfish	5	5
Fish on ice	10	2
Fish oils	18	6
Fish meal	43	10
Salted herring	31	9
Frozen herring	10	2
Herring oil	11	3
Herring meal	12	3

0.36

The recording of the change in length of fiber was carried out by the shift in the ray of light reflected from a mirror fastened to the axis of rotation of the beam of the torsion balance, and also by direct observation with a cathetometer. The protein fiber was fastened at one end by a heart forceps and the other end was attached to a fine silk thread 4 cm. longer treated with vaseline. This was attached to a metal hook by which the protein fiber was suspended on the lever arm of the torsion balance.

Conduct of the experiments. -- The length of the upright fiber was first measured with the cathetometer and then the lower end of the fiber was raised by raising the capillary so that the length of the fiber without a load could be measured. Adenosine triphosphate was added over a definite period of time and then the length of the fiber was remeasured. Knowing the initial length of the fiber and measuring the changes, the authors could determine the relative contraction or stretching of the fiber and express the change in percent of the initial length of the fiber.

Summary. -- Monolayer threads of myosin and actomyosin are elastic-viscous systems with a complex spatial structure. The modulus of elasticity of the actomyosin threads E is 14×10^{-2} kg./cm.^{2}, while the modulus of elasticity of the myosin threads is 5.6×10^{-2} kg./cm.^{2}. Adenosine triphosphate decreases the modulus of elasticity of actomyosin threads (5.62×10^{-2} kg./cm.^{2}) but does not change the elasticity of myosin threads.

Myosin monolayer threads do not contract under the action of adenosine triphosphate. On the contrary, at pH > 7 lengthening of the monolayer threads is observed. The contraction of the actomyosin monolayer threads under the action of 5×10^{-3} M adenosine triphosphate is 40 to 50 percent. The percentage of the contraction depends on the concentration of adenosine triphosphate. The maximum of contraction is observed when the concentration of adenosine triphosphate is 5×10^{-3} M. The decrease of the concentration of adenosine triphsophate causes a reduction of the amplitude of the contraction to 20 percent (at 1×10^{-3} M adenosine triphosphate). The maximum of contraction occurs at pH 7.5 to 7.6.

1.89 THE AUSTRALIAN CRAYFISHERY IS A MONEY SPINNER

Anonymous
World Fishing 9, 29, 30-31 (April 1960)

Crayfish (Panulirus longpipes), 79 percent of which were from Western Australia, earned a record $5,900,000 for Australia in the 1957-58 season. This was an increase of almost 16 percent over the previous year. Whereas the export of crayfish tails increased by about 26 percent, the export of whole crayfish more than doubled the amount of the previous year. Shipments to the United States totaled 6,443,750 pounds, or 97.9 percent of the total export.

After World War II, American buyers investigated Australian crayfish production with a view to bolstering the market in the United States, which then was finding it difficult to satisfy the appetites of an increasingly crayfish-conscious public--a public that demanded quick-frozen crayfish tails.

The Australians, who previously had preserved their crayfish by canning, closed their Geraldton cannery and began using "freezer boats." Boats that previously had been equipped simply to refrigerate their catches were converted to handle the whole process of removing the crayfish tails and freezing them at sea. Soon the Australian fishermen found themselves competing so successfully on the American markets that they surpassed South Africa, which was the original leading exporter to the United States.

Fishermen spend large sums on gear and the upkeep of their boats and, as in all fishing, there are long hours of hard work, risk both financial and physical, little time off and, of course, the need for "luck." But today, individually, the West Australian crayfishermen are better off than they have ever been--crew members may make £ 1,000 to £ 2,000 a season, depending on the boat.

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 ABSTRACTER: Kathryn L. Osterhaug

2.01 MICROBIOLOGY OF SHELLFISH. BACTERIOLOGICAL STUDY OF THE NATURAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS)

Colwell, R. R. and Liston, J. (College of Fisheries, University of Washington, Seattle, Washington)
Applied Microbiology 8, 104-109 (March 1960)

As a result of past work on the bacteriology of shellfish, the practical conditions necessary to prevent and control shellfish-borne infection are now well established. There is, however, an almost complete lack of information concerning the types of bacteria that are associated with shellfish, other than those derived from sewage.

Tanikawa (1937) found that typical water bacteria of the genera Achromobacter, Pseudomonas, Flavobacterium, and Micrococcus were important in the spoilage of market oysters held at 0°C. The results of these spoilage studies are similar to the bacteriological findings for fin fish. In the case of fin fish, it has been established that the spoilage organisms are derived from the flora of the living fish. By analogy it is not unreasonable to suspect that the spoilage bacteria in oysters also are related to the normal bacterial population in the living animal.

The purpose of the study reported by the authors was to determine the composition of the natural bacterial flora of oysters held under controlled natural conditions in various areas of the State of Washington. Coliform counts also were made in order to obtain an indication of the degree of pollution of the environment.

Experimental procedure.--Yearling Pacific oysters, Crassostrea gigas, were placed in floating trays in three different areas of Washington: Hood Canal, Oyster Bay, and Willapa Bay. A control group was maintained in the salt-water aquarium at the College of Fisheries at the University of

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 ABSTRACTER: Kathryn L. Osterhaug

2.111 BRAIDED SYNTHETIC TWINES AND THEIR USE IN THE NEW ENGLAND TRAWL FISHERY

Ruggiero, Michael
Commercial Fisheries Review 22, 6-11 (March 1960)

Synthetic twines were first introduced to the fishing industry shortly after the war by netting manufacturers who spun and twisted synthetic filament into conventional-type twines. These twines proved to be excellent trawl materials owing largely to their increased strength and longer life as compared with natural twines; but many trawl-fishermen felt that the added advantages were outweighed by the added capital expenditure required, and most webbing made from spun and twisted filament has been used by nontrawl segments of the industry--particularly by seine and gillnet fishermen. It became apparent to trawl fishermen, however, that there were definite advantages to be gained from the use of synthetic twines, provided the initial cost could be reduced.

Braided-twine industry.--The 3- to 4-fathom braided cords that could be obtained from surplus Armed Forces parachutes, air-drop cargo nets, and other devices provided a source of low-cost synthetic twine. Application of these materials to trawl construction was the beginning of a new approach to the manufacture of trawl twines and webbing. The braided material, although too thick for extensive use in nontrawl segments of the fishing industry, was ideal for construction of New England-type trawls. It could not, however, be handled by conventional net-making machinery. Net sections had to be made by hand and were limited primarily to cod-end sections by the size of braid available.

Waste material from tire, upholstery, fabric, thread, and firehose manufacturers was tried next. This waste material was hand-braided into a number of sizes of twine suitable for all sections of typical New England trawls, but little attention was paid to blending the yarns or to the uniformity of the final braid and the resulting product did not prove to be as practical as that obtained from Government surplus.

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 ABSTRACTER: Kathryn L. Osterhaug

2.114 BUILT-IN DISCHARGING SYSTEM INSTALLED IN NEW DUTCH TRAWLER

Anonymous
World Fishing 9, 23 (March 1960)

The discharging time for the new Dutch trawler Nicolaas Senior is claimed to have been cut to one-third by the use of a built-in system of conveyor belts. One of these belts runs the length of the fish hold along the axis of the ship and feeds another inclined conveyor which transports the fish through a tunnel to a special hatch in the bow, where a shore-based conveyor system takes over, and carries the fish across the quay to the shed or factory where grading, weighing, or processing is immediately carried out.

One of the reasons for the choice of the bow as a discharging point is that this is usually higher than the quay at any state of tide, which avoids the use of further lifting of the fish.

Reduces damage.--Beside the saving in time and labor, this method is claimed to greatly reduce damage to the fish by handling, and to cut delays and costs. These advantages are said to far outweigh the loss of fishroom space resulting from the installation.

The present arrangement is the result of a series of trials made to determine the optimum conveyor inclination and the best type of belt to lift the fish and accompanying ice without choking the conveyor. A cross-ribbed belt was found to give the best results.

The installation is powered from the shore mains so that no demands are made on the ship's engine room during discharging. Operation is by push-button control, and the equipment is fully protected against damp. It can, in fact, be cleaned by hosing down when the fishroom is washed out,

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CRAYFISH FROM AUSTRALIA

MICROBIOLOGY OF SHELLFISH

SYNTHETIC TWINES FOR FISHING GEAR

BUILT-IN DISCHARGING SYSTEM

2.01 (Cross Reference: 0.5, 1.81)

Washington. The oysters and sea water from the aquarium were sampled weekly and those from the floats every 3 weeks. The study extended over a 4½-month period from February to July 1959.

Bacterial colonies were picked at random from the count plates and the cultures obtained were purified. The pure cultures were tested by a number of determinative methods. Tests for identification and classification were carried out according to the Manual of Microbiological Methods (SAB 1957).

Results.--When the bacteria isolated from the oysters were classified according to genera the results showed that gram-negative, asporogenous rods of Pseudomonas, Vibrio, and Flavobacterium predominated. Gram-positive organisms were found to constitute less than 20 percent of the isolates.

No real difference was found in the generic distribution of organisms isolated from different sites in the oyster or within the flora of oysters maintained in the different geographic areas.

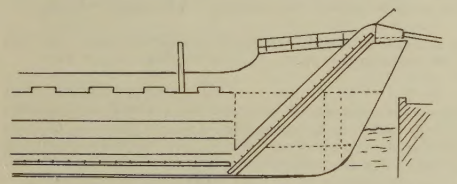
The bacterial flora of oysters that can be considered as "Commensal" flora is composed essentially of typical marine psychrophilic bacteria that are well adapted physiologically to life within the micro-environment of the shellfish.

Twenty-five references are included.

2.114

and care has been taken to avoid inaccessible corners where fish slime might accumulate. The conveyors are made of noncorrodible material, and no special training is necessary for its operation. The conveyor installation on the quay is, of course, mobile and is easily maneuvered into position, and once the necessary connections have been made, the system is sufficiently flexible to allow for the movement of the vessel in a swell.

The Nicolaas Senior is 144 ft. 11 in. overall and was built in Holland, for Dutch owners. Other dimensions are: length b.p. 136 ft. 8 in., molded breadth, 24 ft., draught, 12 ft. 6 in., gross tonnage, 305. The main engine is a diesel developing 900 h.p. coupled to a 2:1 reduction gear.



This sketch shows the layout of the trawler's conveyor belt system through the fish hold and up to the discharge point in the bows, from where the shore system takes over.

1.89

No figures are available for this season so far, but generally speaking prospects are good, and the future holds a promise of even more dollars, as the Commonwealth Government is preparing to survey areas on the south coast of Western Australia for further crayfishing development.

As it was in the beginning, commercial crayfishing in Western Australia is still an Australian-Italian enterprise operating through all-Australian firms, but credit for past progress and future gains must go to the whole team--made up of the fishermen themselves, the scientists, processing and marketing experts, and executives of the State and Commonwealth Fisheries Department, the C.S.I.R.O., and the Department of Trade and Primary Industry, who have guided the industry to its present peak.

Heads or tails? Either wins the money in the Western Australian crayfishing business. When crayfish are processed, nothing goes to waste--the product may go to market boiled whole, as frozen "cray tail," as pieces (legs and claws sold separately), as fertilizer or pig food made from offal, or as poultry meal processed from shell fragments.

2.111

Emphasis was then placed on the use of conventional net-making machinery to replace hand labor. This increased the necessity for obtaining a relatively unvaried source of waste supply for the manufacture of uniform braid. A suitable waste supply was found to be available from the tire-cord industry. Tire-cord manufacturers use high-quality synthetics; their specifications are rigid; and lot samplings are performed routinely to determine adherence to standards for several important qualities. An abundant supply of cord, rejected for tire manufacture, but suitable for twine manufacture is one result of the strict adherence to rigid specifications designed to maintain tire quality.

At the present time, braided netting suppliers: (a) purchase waste tire cord; (b) braid the cord and knit it into webbing by machine; and (c) cut the webbing into trawl sections. The only exceptions to that procedure occurs with heavy braids for cod ends. These are still knit by hand.

Construction.--Two general methods of manufacture are employed by the twine industry--braiding and spinning.

Differences in construction result in differences in physical characteristics of the braided twine, and these determine the behavior of the twines in use, the degree of mesh contraction, and the wearing ability of the twines. The type of fiber, amount of twist in the plys or strands, and the compactness of the twine varies widely and can result in different characteristics in the final product.

Advantage of synthetic twines in the New England trawl fishery.--Synthetic fibers most commonly used in the New England trawl fishery are nylon, dacron, and rayon. Chief advantages of these fibers result from their ability to withstand the effects of micro-organism attack, their high tensile strength and their low level of moisture absorption. The synthetic fibers lose a greater amount of strength through knotting than do natural fibers, but even with this loss, their strength generally remains above the unknotted strength of natural fibers. The initial cost of a section of synthetic trawl webbing is still higher than that of an equivalent-size section of natural-fiber webbing, but the costs are more nearly equal now than in the past. The useful life of synthetic webbing is many times longer than the useful life of natural-fiber webbing. Maintenance of synthetic fibers is simpler and usually cheaper than maintenance of natural-fibers and consists mainly of preventing over-long exposure to sunlight. There is less need for extensive repair when using synthetics as they are more resistant to the force of heavy catches and the blows and snagging effects often encountered in everyday operation.

2.1471 AIRPLANE PILOT DEVISES MACHINE FOR GUIDING MID-WATER TRAWL

Cooke, Roy K.
Maine Coast Fisherman 14, 5 (April 1960)

A Nova Scotian airplane pilot has patented a device to keep midwater trawls at any depth desired. If the idea proves practical for commercial operators, dragger crews can improve efficiency to 30 percent. A 100-ft. vessel would use about a 12-ft. hydrafoil, which costs about $3,000. Costs for smaller boats would be less.

The device looks like a type of model airplane with a 6-ft. wing spread and rear elevators. A towing line from the fishing vessel is fastened to the nose of the "plane" which in turn tows the net. The secret lies in the wings or hydrafoils which keep the "plane" on even keel; the rear elevators control its rise or dive.

When a school of fish is located on the fish finder, an air tank on the device is filled on deck to a desired pressure. This controls the flight the same way that an aircraft is controlled to climb or descend. Water pressure increases about 0.4 lb. per ft. of depth. For instance, it requires 65 lb. of air pressure to dive to 144 ft., more if it is a deeper dive. If fish are detected at 144 ft., the tank is filled through its bicycle-type valve, then the trawl goes over the side. When air pressure and water pressure are equalized, the trawl has reached the required depth. By a system of hydraulics, the air pressure controls the rear elevators so that they cause the net to rise or descend to the required depth.

A new type of net also had to be developed because regular nets would not stay open when towed. Best results were found with a square-shaped net with small otter boards at each corner. Light lines were run from the end of each board to the net opening in order to keep the angle at each

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 ABSTRACTER: Harold C. Johnson

3.12 PROCESSING AND QUALITY STUDIES OF SHRIMP HELD IN REFRIGERATED SEA WATER AND ICE. PART 1- PRELIMINARY OBSERVATIONS ON MACHINE-PEELING CHARACTERISTICS AND PRODUCT QUALITY

Collins, Jeff (U. S. Bureau of Commercial Fisheries, Ketchikan, Alaska)
Commercial Fisheries Review 22, 1-5 (March 1960)

Two shrimp processors at Wrangell, Alaska installed mechanical peelers during the winter of 1957-58, thus introducing into Alaska a mechanized method of preparing shrimp for canning. At about the same time, the industry members in Alaska expressed interest in the use of refrigerated sea water for holding shrimp prior to processing.

Information contained in the literature indicates that refrigerated sea water-holding methods are of considerable advantage with certain fish; however, only a limited amount of information has been published on the holding of shrimp by this method. The alleged advantages of holding shrimp in refrigerated sea water include (1) a greater freedom to fish distant grounds, (2) reduced crushing and breakage of the shrimp, (3) reduced labor costs, and (4) the possibility of maintaining a consistent and economical processing schedule at the plant. In order to evaluate the potential of this holding system, it first was necessary to determine whether or not shrimp held in refrigerated sea water could be peeled satisfactorily with a mechanical peeler.

The primary objective of the work was to investigate the peeling characteristics of pink shrimp held in refrigerated sea water. Secondary objectives were to make a preliminary study of (1) the changes in the composition of shrimp caused by the leaching action of the water used in machine peeling and (2) the effect of refrigerated sea water on the black discoloration of the canned shrimp.

Peeling characteristics. -- In the investigation of peeling characteristics, tests were carried

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 ABSTRACTER: Kathryn L. Osterhaug

2.43 PACKAGES AND PACKAGING MATERIALS

Muir, Allan T. and Macnab, Iain C. S.
Canadian Fisherman 47, 21-25 (March 1960)

The purpose of this paper is to discuss the packaging of a sanitary raw product in such a manner that it reaches the consumer in a palatable, nutritious, and attractive manner. Every link in the chain between the final steps in processing the product and its being popped into the pan by the consumer must be carefully considered before deciding upon the most suitable packaging for a particular product. These links include carriers, refrigerators, warehousers, wholesalers, and retailers.

The authors base their discussion on the assumption that the raw product being packaged is fresh and in a sanitary condition.

Package planning. --Planning the right package for fish or shellfish basically is no different from packaging any merchandise intended for the general consumer except that the perishability of the product must be recognized and compensated for. To be satisfactory, the package (1) must protect the product, and (2) must be an effective merchandising unit.

No matter how successful a package may be from other points of view, if complaints come in that the package is not protecting the product the manufacturer is in for serious trouble.

To design a package to meet the two general objectives listed involves a tremendous amount of research and planning. This is an expensive program.

Seafood packaging. -- Airtight wrapping does not retard spoilage in unfrozen fish, and once spoilage has commenced, the offensive gases accumulate and in many instances the spoilage process

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 ABSTRACTER: Kathryn L. Osterhaug

3.12 THE BACTERIOSTATIC ACTION OF BENZOIC AND SALICYLIC ACIDS I. THE EFFECT ON THE OXIDATION OF GLUCOSE AND PYRUVIC ACID BY PROTEUS VULGARIS

Bosund, Ingmar (Swedish Institute for Food Preservation Research, Gothenburg, Sweden)
Acta Chemica Scandinavica 13, 803-813 (1959)

The bacteriostatic action of benzoic and salicylic acids is well known. The effect of these acids on various enzymes and enzyme systems and on isolated and intact cells has been studied, but the ultimate cause of their growth-inhibiting effect is still open to discussion. The work reported here was designed to determine which vital reactions of the cell are susceptible to benzoic and salicylic acid at concentrations that suppress the growth of micro-organisms. The experiments consisted of respiration studies with resting cells of Proteus vulgaris using the conventional Warburg technique.

Growth experiments. -- The first step in the investigation was to determine the concentrations of benzoic and salicylic acids required to prevent the growth of P. vulgaris. The effect of benzoic acid was studied in the medium adjusted to pH 6.0. The main effect seemed to be a lengthening of the lag phase, but at concentrations approaching those required for a bacteriostatic effect the growth rate in the logarithmic phase also was influenced.

A characteristic result of these experiments was the fact that benzoic acid, even at rather low concentrations, reduced the total amount of bacterial growth. This may be accounted for by the effect of the acid that is formed during growth in increasing the effect of the benzoic acid. A calculation of the actual concentrations of undissociated benzoic acid present at the moment when growth ceased in cultures that contained various amounts of the inhibitor gave the same result in each case.

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 ABSTRACTER: Kathryn L. Osterhaug

GUIDING MIDWATER TRAWL

PACKAGING FRESH AND FROZEN FISH

REFRIGERATED SEA WATER FOR SHRIMP

BACTERIOSTATIC ACTION OF BENZOIC ACID

2.43 (Cross Reference: 3.238)

is actually speeded up. This does not mean that fresh fillets should never be wrapped in airtight wrappers. It does mean, however, that fresh fillets must be of top quality before packaging if they are to maintain their quality. If there is any doubt, they should be shipped unwrapped in ice.

A research team recently formulated the following conclusions in regard to the selection of a package for quick-frozen food products:

1. The package should have low permeability to water vapor and volatiles.
2. The package should be resistant to food juices, acids, and fats.
3. The package should not permit the ingress or egress of odors or taints.
4. The package should be capable of being effectively sealed, preferably by heat.
5. The package should have adequate mechanical strength.
6. The package should be resistant to low temperatures.

3.12 (Cross Reference: 0.5)

Benzoic acid at a concentration of 0.01 M completely inhibited the growth of P. vulgaris at pH 6.0. The same experiment with salicylic acid gave results indicating that this acid is more effective than benzoic acid. Salicylic acid produced bacteriostasis at a concentration of 0.002 M.

Effect on glucose oxidation. -- Preliminary respiration studies at pH 6.0, using glucose as the substrate, showed that neither benzoic nor salicylic acid had any effect on rate of oxygen consumption during the first stage of glucose oxidation. Lower concentrations even tended to increase the rate somewhat, although results varied with growth conditions and with the age of the cells at time of harvesting.

Inhibition of ammonia assimilation during glucose oxidation. -- Bernheim and DeTurk (1951) have shown that salicylic and benzoic acids inhibit ammonia assimilation during succinate oxidation in Pseudomonas aeruginosa more than they inhibit the oxidation of succinate itself. Benzoic acid, at a concentration of 0.007 M, actually had a stimulating effect on the rate of oxygen consumption during glucose oxidation in the absence of ammonium ions. In the experiments with benzoic and salicylic acids, the increase in oxidation rate that accompanied the presence of ammonium ions was completely gone.

The effect of benzoic and salycylic acids on pyruvate oxidation. -- As in the case of glucose oxidation, the results suggest that the chief effect of benzoic acid is related to the oxidation of acetate. The theoretical amounts of oxygen consumed and CO_2 produced during the conversion of pyruvate to acetate are 0.5 and 1.0 mole per mole pyruvate, respectively. The actual values obtained in the presence of 0.0083 M benzoic acid agreed well with these figures. Similar experiments with salicylic acid gave corresponding results.

Discussion. --The experiments described show that the presence of benzoic or salicylic acid during glucose and pyruvate oxidation by P. vulgaris causes an accumulation of acetate in the medium. The utilization of glucose as acetyl-S-CoA, or in some other activated form, in synthesis of cell material and as an energy source is thereby prevented. This suggests that the bacteriostatic effect may be caused by an interference with the metabolism of the acetyl group.

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corner constant. Experiments have shown that the towing warp from the ship has to be twice as great as the depth.

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out using a portable,laboratory, refrigerated sea-water unit in a commercial-processing plant in Wrangell, Alaska. Pink shrimp, Pandalus species, were used since that is the species that constitutes the bulk of the shrimp peeled by machine in Alaska. In the study on machine peeling, three experiments were performed:

Experiment 1: Three hours after being caught, 200 pounds of pink shrimp were placed in refrigerated sea water and held for 18 hours. These shrimp, although of excellent quality and easily peeled by hand, did not peel properly by machine, since the shells had not released from the meats sufficiently.

Experiment 2: The shrimp were held in refrigerated sea water for 40 hours. After this length of time, the shrimp were still of excellent quality, were easily peeled by hand, and were peeled satisfactorily by machine.

Experiment 3: The shrimp were held for 40 hours in 6-percent brine (Roach and Harrison 1954). Although these shrimp did not appear to be markedly different from those in the previous run, the operator of the machine found that the shrimp peeled slightly better. It was his opinion that shrimp held for 40 hours in either refrigerated sea water or in 6-percent brine would peel satisfactorily if the machine were given enough shrimp to adjust the machine properly.

Leaching during peeling. --The extent of leaching of certain soluble constituents during the machine peeling of shrimp was determined. To accomplish this, (1) fresh hand-peeled shrimp, (2) shrimp held in refrigerated sea water for 40 hours and then hand-peeled, and (3) shrimp held in refrigerated sea water for 40 hours and then machine peeled were analyzed for total chloride, total nitrogen, and total volatile base. The data indicate that leaching did occur when shrimp were peeled by machine. Most of the salt that had been absorbed from the refrigerated sea water was leached during the peeling operation. The total volatile base and the total nitrogen content also were decreased during the machine-peeling operation.

Conclusions. --Before the relative usefulness of the refrigerated-sea water system can be evaluated for Alaska shrimp, quantitative data are needed regarding the quality of the product as affected by holding and processing variables.

3.12 ADDITIVES AND FROZEN SEAFOODS

Magnusson, Harris (Director of Technology, National Fisheries Institute, Inc., Washington 9, D. C.)
Quick Frozen Foods 22, 132, 134, 209 (April 1960)

Packers of frozen fish should prove to be comparatively safe from direct attacks by the Food Additives Amendment of 1958. They are vulnerable, however, to indirect assaults. The references in the law to incidental or indirect additives are proving more significant than are the limitations on intentional or direct additives.

The coverage of the amendment includes "any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food...if such substance is not generally recognized...to be safe..."

A fairly careful check of ingredients declared on the labels of frozen fish indicates that packers of frozen seafoods are in a good position. There appears to be no reason to doubt the safety of any of the acknowledged ingredients in or treatment of frozen fishery products. Essentially all of the intentional food additives used in these foods are on the exempt lists, and thus technically are not food additives according to the law.

In the bulk of frozen fishery products the only substance added to fish, shellfish, and crustacea is salt. Even in the most complex frozen seafood dishes there are relatively few chemical additives, and these seem all to be among the exempted substances.

It is obvious that the wise packer will not depend on any general conclusion to the effect that frozen fishery products appear to be free of direct or intentional food additives. Each packer must

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 ABSTRACTER: Kathryn L. Osterhaug

3.19 TOOLING UP FOR LOW DOSE IRRADIATION PROCESSING OF FRESH FOODS

Eukel, Warren W. and Huber, Wolfgang
Food Technology 14, 198-203 (April 1960)

Several aspects of a program for extending the shelf life of fresh foods by low-dose irradiation with a high-energy electron beam accelerator to the point of a commercial process are presented. Mold and fungus damage in cherries, grapefruit, lemons, grapes, peaches, pineapple, and strawberries has been successfully retarded with electron doses up to 300,000 rads. Of considerable importance was the selection of the proper variety of fruit and the utilization of proper handling and holding techniques. Low-dose irradiation extended the shelf life of salmon steaks and sole fillets to about 20 days at a storage temperature of 42° F. Determination of volatile reducing substances, with a value of 15 representing the breaking point between acceptable and spoiled fish, was used to judge the quality of the fish.

A radiation service facility adaptable to pilot-plant processing of fresh foods is described. The projected cost calculations for commercial, low-dose radiation-processing of fresh food are presented in table 2 (see over). The authors postulate that with commodities such as fish fillets and steaks, where a 50-percent beam utilization may be achieved, a throughput or 4.6 tons per hour at 250,000 rads would be possible. The additional cost per 0.25 megarad-pound of the radiation process alone could be as low as 2.8 mils per pound under favorable processing conditions.

See table, over.

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 ABSTRACTER: David T. Miyauchi

3.12 PENETRATION OF TETRACYCLINE ANTIBIOTICS INTO TUNA, SOLE, AND ROCKFISH FLESH AND THEIR STABILITY DURING STEAMING AND RETORTING

Lerke, Peter A. and Farber, Lionel (University of California, San Francisco 22, California)
Food Technology 14, 217-221 (May 1960)

Introduction.--Early in 1959 the United States Food and Drug Administration approved the use of chlortetracycline for treating whole or gutted fish, shucked scallops, and unpeeled shrimp and set a tolerance of 5 p.p.m. of chlortetracycline in these products. This focused attention on the need for more information on the penetration of tetracycline antibiotics into certain Pacific Coast fish. In this class were the tunas, a fishery in which the antibiotics could play an important part. In addition, data for other portions of fish would become important and useful if approval of the use of chlortetracycline was extended to cover fillets and steaks. Also needed was a knowledge of the heat stability or lability of the tetracycline antibiotics during the various stages of the fish-canning processes as well as during the preparation of fish portions for home consumption.

Materials and methods.--Frozen bluefin, skipjack, yellowfin, and albacore tuna were thawed for use in this study. Sole and rockfish fillets were freshly cut from whole fish.

Thawed whole fish were immersed in 5 or 8 percent sodium chloride solutions with or without various concentrations of the antibiotic. These solutions were stored in a cold room at 30° to 35° F. To determine the effect of skin on the penetration of antibiotic, one side of a whole fish was skinned to expose the flesh, whereas the skin on the opposite side was left intact. The fillets were immersed in 5 percent sodium chloride solution that contained various concentrations of chlortetracycline for a period of 5 minutes except in the case of studies to determine the effects of time on the penetration of

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 ABSTRACTER: Martin Heerdt

3.231 CONDUCTION JACKET STORES FOR LOW TEMPERATURES

Pearson, S.
Journal of Refrigeration (January-February 1960)
Torry Memoir No. 24

Fish is a perishable commodity. Even when frozen it should be stored at around -20° F. and under conditions of high humidity. If these conditions are not met, the storage life of frozen fish is short and the end product unpalatable. Recently, it has been suggested that cold rooms suitable for frozen fish could be constructed by sealing the cooling grids within the insulation just inside the lining of the cold room. If a material of high conductivity such as aluminum were used for the lining it would be possible to obtain very even temperatures and high humidity within the room and thus provide the benefits associated with the so-called jacketed cold storage.

A cold storage that employs refrigerated grids buried within the insulation obtains the benefits of an air-jacketed storage by means of thermal conduction and could therefore be called a conduction jacket storage.

The performance of a conduction jacket storage has been predicted by means of an electrical potential analogue that makes use of a sheet of conducting paper that simulates the thermal insulation of the room by forming a scale representation of a section of the insulated wall.

In the analogue, current represents heat flow and voltage difference represents temperature difference. Constant temperature surfaces are represented by coating the appropriate parts of the sheet with a paint which is such a good conductor that the voltage across it can be neglected. The outer surface of the cold store-wall and the bulk of the cold air within the store are represented by

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 ABSTRACTER: Kathryn L. Osterhaug

ADDITIVES AND FROZEN FISH

PENETRATION OF TETRACYCLINE ANTIBIOTICS

PRESERVATION BY IRRADIATION

JACKETED COLD STORAGE

3.12

chlortetracycline. Antibiotic assays to determine the degree of penetration were carried out according to a modification of the procedure of Grady and Williams.

Heat inactivation treatment.--After removal from the immersion solutions, the tuna were lightly rinsed with a fine spray of fresh water to remove any antibiotic solution adhering to the outside, sampled, and eviscerated according to the usual commercial practice. The eviscerated fish were heated in flowing steam in a closed retort at 212° to 214° F. for increasing periods of time, removed from the steam, cooled at room temperature, and sampled similarly to the raw fish. The fish were then cleaned and separated into loins, canned with a vegetable oil, and sterilized by heating for 75 minutes at 240° F. Sole and rockfish fillets were heat treated in three ways: steamed in free-flowing steam for 5 and for 10 minutes, baked in a preheated hot-air oven at 350° F. for 15 and for 30 minutes, and lightly fried for about 5 minutes to a golden-brown color in hot oil in a frying pan. Two fillets were used in each assay for chlortetracycline. Assays were run in triplicate.

Results.--NaCl did not affect penetration of the antibiotics into tuna flesh. The skin and outer layer of flesh acted as a very efficient barrier to the penetration of the antibiotics into the deeper layers of the meat. This decreased penetration facilitated the subsequent destruction of active antibiotic during the steaming operation, which is part of the tuna-canning procedure. No active antibiotic residues were found in any cans of tuna packed from antibiotic-treated fish.

The absorption of chlortetracycline by sole fillets was quite rapid during the first 5 minutes of immersion, after which the rate tended to decrease during the first hour. The chlortetracycline in sole and rockfish fillets was quite stable during 7 to 8 days' storage at 41° C.; average losses during the storage periods were 16.8 and 16.5 percent, respectively. Steaming, baking, and frying, which are simulative of home preparative procedures, markedly inactivated the active chlortetracycline originally present in the fillets of sole and rockfish. The actual amounts of antibiotic remaining after the various heat treatments were very small.

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strips of the conducting paint. The refrigerated grid is represented by discs of the conducting paint, which are all maintained at zero potential because they represent the coldest part of the system. The aluminum lining is simulated by a narrow strip of paint formed by mixing graphite and conducting paint in such a way that the resistance of the strip exactly simulates the thermal resistance of the aluminum sheet. The boundary layer between the aluminum lining and the bulk of the cold store-air is simulated by a strip of paper of suitable width. The strip is slotted to prevent lateral current flow. A low voltage is provided from an accumulator and any fraction of this may be applied to the inner and outer boundaries of the analogue via a pair of potential dividing variable resistors. The currents flowing through the parts of the analogue are measured by means of microammeters. The analogue potentials are measured by means of a potentiometer, which is connected to the pipe grid part of the analogue at its negative terminal and to a conducting probe at the positive one. When the potentiometer is balanced, no current is drawn by the probe, which can therefore be used to measure voltages and to plot isopotential lines without affecting the current flow in the model.

The analogue has been used to estimate the effects of various pipe spacings and the effect of internal loads caused by variation in lighting and operators. It was designed to simulate the case where the pipe grids were very near the aluminum lining of the store but did not touch it. Better thermal contact than this would, of course, lead to more efficient operation.

Results.--It appears from the analogue results that a conduction jacket store is feasible even if the pipe grid is not in direct contact with the conduction lining.

One of the disadvantages of the conduction jacket system is that a perfect vapor seal is required at the inner and outer surfaces of the insulated wall if an accumulation of frost in the insulation is to be avoided. Insulants of the polyurethane type that are foamed in place appear to be suitable for conduction jacket storage construction; however, the fact that one test box out of four contained cavities is an indication that close control and supervision is necessary with this type of insulation.

3.12 (Cross Reference: 3.19)

study the amendment carefully and check his own list of ingredients against the published lists of exempted substances, proposed exempt substances, and permitted food additives.

It also is necessary to consider all possible indirect food additives as the amendment clearly covers far more than the normally declared raw materials. It limits the use of substances in treatments that simply affect the characteristics of the food, even though no trace of these substances remain in the finished product. Also, any material that incidentally transfers to the product from handling or processing equipment, or from packaging material is subject to regulation.

Packaging materials appear to be the most publicized possible sources of incidental additives. Almost half of the substances that are listed as exempt, proposed to be exempt, tolerated, or temporarily tolerated, are materials that are used in packaging materials and that could migrate to the food.

Since packers of frozen fish and shellfish are in no position to test all of the packaging materials they use, they must depend on their supplier for reliable information and for guarantees. Although a guarantee does not transfer full responsibility to the package supplier, it does give strong evidence that the packer is acting in good faith and endeavoring to avoid indirect additives that are not tolerated.

The packer should insist that the guarantee be based on analyses of substances extracted both in aqueous media and in fat solvents.

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Table 2.--Operations cost per hour for commercial, low-dose radiation-processing of foods with high energy electrons from a linear accelerator.

Capital cost, 8 mev. 5 kw. Linac installed	$170,000
Capacity, at 250,000 rad and 50% beam efficiency	9,200 hour

	Hourly cost of operation	
	For 6000 hr. triple shift yr.	For 2000 hr. single shift yr.
Operation costs		
Return on invested capital	$ 4.25	$12.75
Depreciation--10 yrs.	2.64	7.92
Direct labor--operator, helper	5.00	5.00
Utilities	0.50	0.50
Maintenance	8.80	8.80
Overhead, taxes, insurance	2.50	2.50
R + D costs	2.30	2.30
	$25.99	$39.77
Cost per 0.25 megarad-pound		
Linac		
50-percent beam utilization	$ 0.0028	$ 0.0043
25-percent beam utilization	0.0056	0.0086
Cobalt-60 (335,000 curies; $0.34/curie)		
50-percent beam utilization	0.0150	....
25-percent beam utilization	0.0300	....
Cesium-137 (1,220,000 curies; $0.60/curie)		
50-percent beam utilization	0.0280	....
25-percent beam utilization	0.0560	....

3.231 NEW VERTICAL-PLATE FREEZER STEPS UP PERFORMANCE

Gemmill, Arthur V.
Food Engineering 32, 66-68 (April 1960)

Introduction.--Just unveiled is a radically new, food freezer unit that employs vertical plates between which the packages move downward intermittently. Frozen products are discharged from the bottom of the unit and automatically conveyed to wrappers or case packers. This unit is presently being used for freezing ½-gallon rectangular packages of ice cream at a rate of approximately 800 gallons per hour, but it also is adaptable to freezing foods such as fish, meats, fruits, and vegetables if packed in rigid containers.

Features.--The new unit, which is called a cyclomatic vertical-plate freezer, provides: (1) a gravity-feed, full-flooded system for maximum heat transfer between plants and products; (2) vertical position of packages during freezing with headspace at top, which minimized the need for insulation against air; (3) faster freezing owing to more intimate contact between plates and cartons, which is brought about by uniform application of hydraulic pressure to the planiform plates; and (4) regular removal of entrapped oil since the refrigerant is drained daily.

Construction details.--The unit comprises seven parallel, freezing plates 168 inches long by 65 inches high. These provide six channels of equal dimensions in which products are frozen. Each plate is made up of 56 individual, open-end rectangular tubes 2x2x65 inches long and welded together. A horizontal 2x3-inch tube is welded to the bottom of each plate to form a liquid header from which ammonia is uniformly fed into each of the vertical tubes. Another 2x5-inch header is welded to the top of each plate for quick transfer of ammonia gas to an accumulator. The liquid level of the ammonia in the tubes is controlled by a float valve.

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 ABSTRACTER: Martin Heerdt

3.2495 CORRELATION OF TASTE PANEL GRADINGS WITH SALT-EXTRACTABLE PROTEIN OF FROZEN FISH FILLETS

Moorjani, M. N.; Montgomery, W. A.; and Coote, G. G. (Division of Food Preservation and Transport, C.S.I.R.A., Homebush, N.S.W., Australia)
Food Research 25, 263-269 (March-April 1960)

Introduction.--Frozen fish deteriorate in quality after storage for several months. This is partly due to changes in texture that give the cooked flesh what has been described as a "raggy" or "tough" feel on the palate. The existence of a relationship between the texture of the flesh and the state of the muscle proteins was first suggested by Reay (1933), who showed that the proteins became less easily extractable by dilute salt solutions when the fish had been held in the frozen state for some time. Dyer, French, and Snow (1950) showed that this change, which has been considered to be an indication of denaturation, was confined to the structural muscle fiber actomyosin, the protein mainly responsible for the texture of fish muscle. The relationship between the amount of actomyosin extractable by salt solutions and texture values as measured by taste panels has been studied by Dyer (1951), Dyer and Morton (1956), Dyer, Morton, Fraser, and Blight (1956), and Love (1956).

Purpose.--The study described in this paper was designed with the object of obtaining data that could be analyzed statistically. This study is concerned with the ability of a taste panel to detect texture differences in fish held in frozen storage and to relate these differences to the amount of extractable actomyosin.

Experimental methods.--The fish used in this investigation were morwong (Nemadactylus macropterus), a common commercial species. They were from the same catch and of good quality. Fillets from these fish were (1) packed in small cans sealed under a vacuum of 22 inches of mercury

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 ABSTRACTER: Martin Heerdt

3.2492 THE MOISTURE DISTRIBUTION IN FROZEN MEAT OF SWORDFISH DURING COLD STORAGE

Tsuchiya, Yasuhiko and Uchimi, Shizuo (Tohoku University, Sendai, Japan)
Tohoku Journal of Agricultural Research 10, 71-73 (March 1959)

Introduction.--Frozen products must be packaged with caution or serious desiccation, significant weight losses, inferior quality from oxidation of fat, discoloration, and denaturation of protein will occur. These undesirable changes take place in meat that is not enclosed in a moisture-vapor-proof wrapper. The present study was made to quantitatively analyze moisture distribution in the meat of frozen fish during cold storage.

Materials and methods.--Material used was a fillet of swordfish in which the moisture appeared to be uniformly distributed throughout. This fillet was cut into 6-cm. cubes. Each cube was wrapped in close contact with a sheet of polyethylene, tied with polyvinyl tapes, and sealed in a cellophane bag. The bags were divided into two groups that were stored, respectively, at -10° and -20° C. for 107 days. After storage, slices were cut from the frozen samples to obtain a 1-cm.-thick slice from the surface, a 1-cm.-thick slice from midway between the surface and the center, and a 1-cm.-thick slice from the center of each cube. An oven-drying method was used to determine the moisture content of each of these slices.

Findings.--An analysis of the data showed that the transfer of moisture from the interior of the swordfish meat to its surface was very small. This confirmed Rutov's opinion that the desiccation of frozen foods proceeds in compliance with the laws of surface evaporation as does the sublimation of ice. In short, moisture does not migrate appreciably from the interior to the surface of the swordfish meat.

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 ABSTRACTER: Martin Heerdt

3.26 HOW ABOUT ALL THOSE LOCAL VARIETIES OF FISH?

Anonymous
Seafood Merchandising 20, 23-26 (April 1960)

An important problem of the American seafood industry is the successful processing and packaging of the many varieties of fish that are found in United States coastal waters. Most of these fish, particularly the smaller species, do not lend themselves to filleting or steaking in a manner that would place them in a competitive position with such species as cod, ocean perch, or halibut. Higher original cost of production and lower volume of production act as deterrents to the successful merchandising of a number of species of American fish.

The merchandising of fresh fish in modern consumer outlets is subject to many problems. Many retail food stores sell no fresh fish and the average consumer does not have access to fresh products. This situation is becoming more, rather than less, common.

The problems of the producer of fresh fish can be solved only by offering his production to modern consumer outlets in a form that will find acceptance there. This should not be an insurmountable problem as many factors favor the successful merchandising of seafood. A growing population requires seafood in ever greater quantities. Fish and shellfish are among our most valuable foods from a nutritional and health standpoint and making them available to the average family is a public service.

Spanish mackerel has been successfully processed and marketed through cafeteria chains in Florida. The Spanish mackerel is put out in fillet form by a company in St. Petersburg, Florida. By finding the correct package for a specific market and cultivating that market through constant

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 ABSTRACTER: Kathryn L. Osterhaug

3.2492

The amount of water lost from the meat was greater in the meat kept at -10° C. than it was in meat kept at -20° C. It is probable, therefore, that the rate of evaporation of moisture from the frozen meat was greater in meat kept at -10° C. than it was in the meat kept at -20° C. during storage.

Moisture distribution in frozen swordfish meat during storage

Time (days)	Moisture (percent)					
	Surface layer		Middle layer		Central layer	
	-10° C.	-20° C.	-10° C.	-20° C.	-10° C.	-20° C.
0	77.80	77.80	77.80	77.80	77.80	77.80
2	74.96	76.71	75.88	77.36	75.02	77.32
7	75.58	75.89	77.12	77.14	77.45	76.31
23	76.30	75.19	77.77	77.00	77.81	77.45
50	74.47	74.85	76.67	76.92	76.83	77.15
107	72.30	73.92	75.75	77.34	75.89	77.54

3.26 (Cross Reference: 3.230)

upgrading and stress on quality, a demand was created that did not exist before, and both the public and the producer are better off.

A fish company, in Portsmouth, Virginia, has pioneered in the packaging of domestic species of fish. Porgies, bluefish, flounder, sea bass, mackerel, pan trout, butterfish, Ocean View spot, striped bass, and croaker are put up on 1-pound consumer packs. The entire line of fish is put up in attractive window packages that consist of a plastic pouch inserted in a window box. The fish are scaled and dressed with heads removed and each 1-pound unit is vacuum packed. The pouches contain from two to six fish each.

The aim of the operation is to establish a nonseasonal business with a stable year-round price.

The quality of the fish in the pouch is credited with the steady growth of the operation. Quality is guarded by proper handling, efficient icing, and speed of handling until the product is packaged and frozen. The bag pack has been found to prevent dehydration and freezer burn for up to 2 years of frozen storage.

3.231

How freezer operates. -- Packages are conveyed continuously from the filler to an elevator that raises them to top of the unit and aligns them with the six ready-rails above the freezing channels. When six packages are aligned, a pusher bar with six individual shoes move them into the rails, then retracts until another group of six packages are ready.

When a complete top layer has formed, the freezer plates open and elevators (one under each channel) raise the entire load of packages and pick up the top layer of packages from the rails. The elevators then lower the entire load until the bottom layer of packages is below the freezing plates and the top layer has moved into the freezing channels. At this stage, the plates close, and the freezing operation is resumed. The elapsed time between the opening and the closing of the plates is less than 5 seconds. This interval does not allow time for frost to build up on the plate surfaces. Insulation is provided to protect the unused surfaces of the two outer plates. The upward movement of the elevators loosens any packages that may have frozen to the plates; and, when the plates close, a cross-shear mechanism separates the bottom layer from the one remaining in the freezer. Belts, in the top of the elevators, then discharge the frozen packages to a conveyor that feeds bundling or casing equipment.

Capacity. -- The unit will freeze 1,872 ½-gallon-size rectangular packages at one time in slightly over 65 minutes. Estimated freezing capacity of the unit is approximatly 5,000 pounds per hour, but this will vary with the product being frozen, the incoming product temperature, and the desired discharge temperature of the product.

3.2495

and held at -18° C., (2) sealed in M. S. A. T. cellophane bags and held at -18° C., and (3) sealed in M. S. A. T. cellophane bags and held at -10° C. To eliminate between-fish variation from experimental error, the treatments were applied to fillets (halves of fish) in a balanced incomplete block design for 0 (initial), 1, 2, 3, 4, and 6 months. On removal from storage, the fillets were held at 0° C., skinned, and used for the determination of salt-extractable protein and for sensory-difference tests for texture.

Nitrogen assays. -- After partial thawing at 0° C. for 2 hours, a central longitudinal strip from each fillet was thawed at room temperature for 30 to 40 minutes. Then a 20- to 30-g. sample of each central strip was extracted with 900 ml. of chilled, neutral 5-percent solution of sodium chloride with the aid of a Waring Blendor and baffle plate as described by Dyer, French, and Snow (1950). The salt-extracted nitrogen consisted of the freeze-labile actomyosin, the stable albumen, and nonprotein nitrogen fractions. This nitrogen was determined from an aliquot of the extract by a micro-Kjeldahl method using the modification of McKenzie and Wallace (1954). The nonprotein nitrogen of the extract was determined on a further aliquot after precipitation of the protein with a 5-percent trichloroacetic acid solution. Total nitrogen for the central strip of each fillet was measured by the Kjeldahl-Wilfarth-Gunning method of the A. O. A. C. (1950) on a portion of the mixed sample by using at least 2 g. for digestion.

Sensory examinations. --Samples cut and coded at 0° C. were placed in flowing steam while frozen, cooked for 15 minutes, placed in glass dishes, kept warm, and served to the 12 experienced fish tasters. The taste tests were paired comparisons where judgments were made on texture with the preference going to the less tough. A yes-no judgment for texture acceptability was also requested.

Results. --Differences in salt-extractability were associated with texture differences after storage times of 2 to 6 months and under the conditions of storage outlined above. Tasters were unable to distinguish differences in samples at the end of 1 month's storage. Two well-defined rates of loss of extractability were indicated by the regression of protein with time in storage. The initial rapid rate of change depended on temperature, whereas the subsequent slower rate was the same for the three storage conditions. The texture and salt-extractable protein of fish stored in evacuated cans was not significantly different from the controls.

4.11 DETERMINATION OF FREE FATTY ACIDS IN FAT

Hornstein, Irwin; Alford, John A.; Elliott, L. E.; and Crowe, P. F.
Analytical Chemistry 32, 540-542 (April 1960)

Introduction.--A method is described by which free fatty acids in meat can be separated from unsaponified fat by adsorption of the free fatty acids on an ion exchange resin. The fat is washed from the resin with petroleum ether and the free fatty acids are then converted directly on the resin to the methyl esters with methanol-HCl.

Experimental.--A fat emulsion sample containing 0.1 to 1.0 g. of fat is diluted with an equal amount of ethanol, made acid to bromophenol blue with 1N H_2SO_4, and extracted with two 20-ml. portions of petroleum ether. Then the aqueous layer is discarded. For unemulsified samples, 0.1 to 1.0 g. of fat is dissolved directly in petroleum ether. In either case, 10 to 25 mg. of n-heptadecanoic acid, which is used as an internal standard, is added to the petroleum ether solution; and the latter is then decanted onto 10 g. of pretreated Amberlite IRA 400 in a 250-ml. flask. Two 5-ml. portions of petroleum ether are used to wash the residual solution into the flask, after which the mixture is stirred for 5 minutes and the supernatant liquid is discarded.

A 25-ml. portion of anhydrous methanol-HCl is added to the resin, and the mixture is stirred for 25 minutes. Then the liquid is decanted through a filter, and the resin is washed and stirred with two successive 15-ml. portions of the methanol-HCl solution. The wash liquids also are decanted through the filter. Ten ml. of distilled water are added to the extracts, and the solution is extracted with 50 ml. of petroleum ether. The aqueous phase is extracted twice more with 20-ml. portions of petroleum ether. The combined petroleum ether extracts are washed free of acid, dried over anhydrous Na_2SO_4, and concentrated under nitrogen on a steam bath. The fatty acids are quantitatively transferred to a 1-ml. volumetric flask, and an aliquot is used for analysis by gas chromatography.

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 ABSTRACTER: Wm. Theodore Roubal

4.5 INVESTIGATIONS ON FACTORS INFLUENCING RANCIDIFICATION PARTICULARLY AMINO ACIDS AND TOCOPHEROL

Anonymous
Redogörelse för Arbetsåret July 1, 1958-June 30, 1959. Svenska Institute for Konserveringsforskning, Göteborg, Sweden SIK Report No. 71, 35-36 (1959)

The effects of amino acids have been studied in three systems: (a) oxidation of herring oil in emulsions, (b) autoxidation of linoleic acid, and (c) oxidation of linoleic acid catalyzed by haemoglobin.

Rancidification has been followed by determination of oxygen consumption in a Warburg-apparatus.

The investigation has shown that the effect of the various amino acids can be rather different and that the effect of an acid can vary in different systems or under different circumstances. Amino acids can, depending on their concentration, act either as prooxidants or antioxidants. The antioxidative effect can be independent of so-called primary antioxidants, but it can also be synergistically enhanced in the presence of tocopherol.

Most of the amino acids that were examined had antioxidative effect on herring oil in emulsion. The effect of histidine was relatively strongly antioxidative, whereas cysteine was strongly prooxidative. The addition of phosphate increased the rate of oxygen consumption but, at the same time, the antioxidative effect of amino acids was strengthened. In the presence of both tocopherol and amino acids, the resulting oxygen consumption corresponded to the product of the individual effects.

In the autoxidation of linoleic acid, cysteine was found to be prooxidative in the whole concentration range investigated, whereas the effect of histidine and alanine was antioxidative at lower, and

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 ABSTRACTER: Kathryn L. Osterhaug

4.21 OXIDATION OF FAT IN MODEL SYSTEMS RELATED TO DEHYDRATED FOODS

Bishov, S. J.; Henick, A. S.; and Koch, R. B. (Quartermaster Food and Container Institute for the Armed Forces, Chicago 9, Illinois)
Food Research 25, 174-182 (March-April 1960)

Introduction.--The recent development of a great variety of dehydrated quick-serve ration items by the Quartermaster Food and Container Institute for the Armed Forces has again emphasized the need for means of inhibiting oxidative deterioration of the dispersed fats. For the present study, the author decided upon a model-system approach that would permit an investigation of oxidation problems in general and closer control of the variables than would be possible with food items. Natural antioxygenic compounds in fresh foods, among which are tocopherols and phospholipids, have an important function in minimizing the deterioration of food fats. Some foods, however, contain oxidative catalysts such as heme compounds that promote deterioration. Heme compounds are widely distributed in foods of animal origin, and their importance in the oxidative fat rancidity that occurs in these foods is well recognized.

The antioxygenic properties of vegetable phospholipids have been studied by Evans (1935), Olcott and Mattill (1936), and Patrick and Morgan (1944); the antioxygenic action of egg phospholipids has been demonstrated by Dutton and Edwards (1945), Lightbody and Fevold (1948), and more recently by Henick, Togashi, and Mitchell (1958). Brown and Tappel (1958), Robinson et al. (1924), Tappel (1953 and 1955), and Watts (1954) have shown that hemoglobin and other heme compounds act as powerful biological catalysts for oxidation of fat.

Purpose.--These studies were made to determine by means of model dehydrated colloid systems

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 ABSTRACTER: Martin Heerdt

4.62 ON THE ANTIOXIDANT ACTIVITIES OF THE TOCOPHEROLS. II. INFLUENCE OF SUBSTRATE, TEMPERATURE AND LEVEL OF OXIDATION

Lea, C. H. (Low Temperature Research Station, Downing Street, Cambridge, England)
Journal of the Science of Food and Agriculture 11, 212-218 (April 1960)

Introduction.--In the first paper of this series the relative antioxidant activities of the seven tocopherols, some natural and some synthetic, were compared in the methyl esters of lard fatty acids at 90° C. and in methyl linoleate at 50° C. In both systems δ- and γ-tocopherol were the most and ϵ, ζ-, and α-tocopherol the least effective of the series, with η- and β-tocopherol being in between. The precise order, however, depends on the conditions and concentrations used.

Data, obtained mainly by high temperature methods in lard and reported in the literature, indicated activities increasing in the order $\alpha- < \beta- < \gamma- < \delta$ tocopherol. This data was confirmed; and the sharp discrepancy that existed between relative in vitro antioxidant activity and relative in vivo vitamin-E potency was emphasized. Even at 50° C. no support could be found for the claim of Hove and Hove (1944) (1) that the high antioxidant activity of γ-tocopherol as compared with α-tocopherol holds only at high temperatures of testing and (2) that at lower temperatures there is little difference in the activities of the α-, β-, and γ-tocopherols, with α-tocopherol actually being the most and γ-tocopherol the least effective during the earlier stages of the oxidation. Most of the reversal of the order of activity observed by Hove and Hove occurred, however, at temperatures of 35° C. and below. With the techniques used in Part I of this series, the authors were not able to obtain reproducible estimates of the relative antioxidant activities of the tocopherols at temperatures as low as 37° or 25° C.

In the present study, this difficulty has been greatly reduced by an improved method of testing

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 ABSTRACTER: Martin Heerdt

FREE FATTY ACIDS DETERMINATION

OXIDATION OF FAT IN MODEL SYSTEMS

FACTORS INFLUENCING RANCIDITY

ANTIOXIDANT TOCOPHEROLS

4.21 (Cross Reference : 3.6)

what effect phospholipids and proteins have on the rates of oxidation of dispersed fat in systems that may contain oxidation-promoting hematin compounds. The study was, of necessity, exploratory in nature because rates of reaction of fat and other food components in the newly developed freeze-dried foods have not been studied extensively.

Experimental. -- Dehydrated fatty emulsions with an inert matrix of carboxymethyl cellulose were used to evaluate the roles of proteins and phospholipids as antioxidants and of iron compounds as prooxidants in accelerated lipid oxidation experiments. Dehydration was carried out by means of freeze-drying similar to that described by Rolfes et al. (1955). Samples were aged by aerating them in a rancimeter at elevated temperatures to permit acceleration of oxidative reactions. The method used was similar to that described by Salwin et al. (1958). Extent of oxidation was evaluated by means of the ferric thiocyanate method of Hills and Thiel (1946) for assaying peroxides spectrophotometrically at 510 mmc. Carbonyl and other compounds, which were collected as volatiles from aerated samples, were assayed by means of 2-thiobarbituric acid reagent using a method similar to that described by Sidwell et al. (1954).

Results. -- Phospholipids, in concentrations of 0.5 to 5.0 percent of the dry weight of the fat, protected soy oil against oxidation. Protein-containing fat emulsions were more stable than emulsions with fat only; and, in combination with phospholipids, they provided ever greater protection. The catalytic effect of hemoglobin accelerated the rate of oxidative reaction to the point of spontaneous combustion within minutes in the dried emulsions stored at 85° C.

Oxidative reaction rates in dehydrated systems containing prophyrin compounds were significantly more rapid than in fluid systems when measured by peroxide and thiobarbituric acid values. The prooxidant effects of ferric citrate were very small compared to those of prophyrin compounds. Phospholipids alone or in combination with proteins provided significant antioxidant action in dehydrated emulsions that contained prophyrin compounds. In contrast, the phenolic antioxidants, butylated hydroxytoluene, and nordihydroguiaretic acid at concentrations of up to 0.03 percent of dry weight, had only slight effects.

4.11

The resin pretreatment consists (1) of converting the resin to the OH form with a base, (2) of washing the resin free of excess base, (3) of washing with three successive 25-ml. portions of anhydrous ethanol, and (4) of washing with three successive 25-ml. portions of petroleum ether.

Chromatography. --The column used for analysis by gas chromatography consisted of an 8-foot length of $\frac{1}{4}$-inch outside diameter coiled copper tubing for a Beckmann GC-2 apparatus. This column was packed with polyvinyl acetate (approximately MW 1500, grade AYAC, Bakelite Div., Union Carbide Corp.) in a ratio of 1 to 5, weight per weight, on Chromosorb 30/60 mesh. The polyvinyl acetate was deposited on the Chromosorb by evaporation of an acetone solution of polyvinyl acetate from a shallow tray while the mixture was being stirred. Helium carrier gas was used at a rate of 80 to 85 ml. per min. with the instrument at 205° C. and with a sample that consisted of a 5 μl. petroleum ether solution containing 250 to 1000 γ of esters.

A standard solution in petroleum ether containing 5 mg. per ml. of each of the pure fatty acid esters that were studied was prepared; and 5, 10, and 20 μl. of this solution was chromatographed. Peak areas were calculated. Since the different esters did not give the same area response per microgram, the areas were calibrated for each acid in micrograms of acid per square millimeter. The authors found that 1 square millimeter of area was equal within ±1.0 percent for each of the three dilutions of a given ester. When known mixtures of fatty acids were carried through the procedure, quantitative results were obtained by using a factor based on the percent recovery of the C-17 acid. Thus, in a given run, if the recovery of C-17 acid was 82 percent, then all other acid recoveries were divided by 0.82 to give corrected values. Absolute recoveries ranged from 60 to 95 percent. Best recoveries were obtained with samples that contained 25 to 200 γ of free fatty acids.

4.62

in which the unsaturated esters used as substrates are first made peroxide-free and then standardized by the addition of small quantities of the peroxidized ester to provide by their decomposition a supply of chain-starting free radicals. Under these conditions the relative antioxidant activities of the tocopherols have been found to depend in a major degree on the fatty acid composition of the substrate as well as, to some extent, on the temperature and level of oxidation at which the comparison is made. Under suitable conditions, the relative order, hitherto observed for systems in which linoleate is being oxidized at high temperatures, can be reversed. As a result, α- becomes the most and δ- the least effective of the common tocopherols. This conforms to the order of the observed in vivo activities of vitamin E.

Experimental. -- The antioxidant activities of the tocopherols have been compared at 60° C. and at 37° C. in distilled methyl esters of cottonseed, linseed, and cod-liver oil fatty acids which contained small additions of oxidized ester as a starter.

Findings. --In the linoleate (cottonseed) system γ- and δ-tocopherol were the most and the α-, ζ-, and ϵ-tocopherol the least effective in extending the induction period. In the polyunsaturated (linseed and cod-liver oil) systems γ-tocopherol was still good, whereas δ-tocopherol was at the bottom of the series and α- and ζ-tocopherol were near the top.

Factors, in addition to the presence of polyunsaturated fatty esters in the substrate, which tended to favor a relatively high activity of α-tocopherol, were (1) a comparison of activities at a low peroxide value still within the induction period and (2) a not too high temperature of oxidation. Under suitable conditions α-tocopherol could be shown to exert the highest and δ-tocopherol the lowest in vitro antioxidant activity, in agreement with their known in vivo vitamin-E potencies.

The antioxidant activities of the tocopherols also were considered in relation to their structure.

4.5

prooxidative at higher concentrations. The antioxidative effect was enhanced synergistically in the presence of tocopherol.

The oxidation of linoleic acid catalyzed by haemoglobin has a course different from the two types mentioned above. A very pronounced induction period takes place during which practically no oxygen is consumed. The length of this period is dependent on the concentration of tocopherol. The induction period is shortened by the presence of histidine (prooxidative effect); however, cysteine decreases the oxygen consumption in this system.

Earlier observations on the effect of tocopherol revealed that very small concentrations act prooxidatively. These observations have been confirmed by experiments on herring oil that had been deprived of its content of tocopherol by chromatography. An investigation has been started that is designed to follow the decrease of the various tocopherols during rancidification and to study the supposed interactions between the concentration of these tocopherols and the rate of rancification. Several methods to determine the various tocopherols have been tested, and a technique utilizing paper chromatography has been worked out.

5.111 ISOMERS OF VITAMIN A IN FISH LIVER OILS

Brown, Patricia S.; Blum, William P.; and Stern, Max H. (Harvard University, Cambridge, and the Research Laboratories of Eastman Kodak Company)
Nature 184, 1377-1379 (October 31, 1959)

Introduction.--The authors have investigated the occurrence of the 'iso-a' and 'iso-b' isomers of vitamin A in a number of fish-liver oils by means of their reaction with the retinal protein, opsin. These isomers were found to constitute about 20 percent of the vitamin A that was found in cod, shark, and mixed fish-liver oils. Since Robeson et al. (1947) first reported the presence of all-trans vitamin A and neovitamin A (neo-a) in fish-liver oils, all four of the 'unhindered' isomers have been found in these oils. This finding is important because the iso-a and iso-b isomers have only about one-fourth of the growth-promoting activity of all-trans vitamin A as measured by rat bioassay (Ames et al. 1958).

Nomenclature.--The trivial names devised by Hubbard and Wald (1952 and 1953) are used in this report for lack of official action on a numbering system. The numbering systems now used include (1) the Geneva system, which is used by Chemical Abstracts (1956) and by Distillation Products Industries Laboratories and (2) the system analogous to that used with the carotenoids, which is used by Wald, Brown, Hubbard, and Oroshnik (1955).

History.--Hubbard and Wald first reported on the presence of a cis-isomer of vitamin A in a concentrate from fish-liver oils in 1952. This isomer was different from the neo-vitamin A found by Robeson and Baxter. Later studies by Hubbard and Wald (1952 and 1953) on pure retinene (vitamin-A aldehyde) isomers, which had been synthesized in the laboratory, showed that the isomer in fish-liver oil was iso-a vitamin A. The basis for the identification was the observation that both iso-a retinene and a retinene that corresponded to the cis-isomer formed the same pigment with

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6.190 ACCEPTABILITY OF FISH MEAL TO YOUNG TURKEY POULTS

Krautman, B. A. and Caskey, C. D.
Feedstuffs 32, 74-75 (March 26, 1960)

Introduction.--During 1955, the authors observed that certain feeds were not acceptable to young turkey poults and decided to study the cause of the reduced acceptability. About 50,000 day-old poults were used in this study. Poults from the same breeder flock were randomly distributed for use in each test. Rations and water were supplied free choice. After the poults had been on the test diet for 10 or 11 days, they were graded on a commercial basis into top-quality and cull-quality poults.

Findings.--In the first trial, 20,000 poults were maintained on a diet that contained 4 percent fish meal. When these poults were 6 days' old, one-half, or 10,000 of them were moved into an alternate battery and placed on a control diet that did not contain fish meal. All poults were graded when they became 11 days' old. In a comparison with the control diet, 4 percent fish meal in the diet of the poults produced 1.41 times as much mortality and 2.28 times as many culls.

Results from the second trial, using 400 day-old poults per treatment, showed that as the percentage of fish meal in the diet increased, both mortality and the number of culls increased.

Results from the third trial, using 400 poults per treatment, showed a tremendous increase in culls when either domestic or imported African fish meal was included in the diet.

Results from the fourth trial, using fumigated Peruvian fish meal and 400 poults per treatment showed a marked increase in culls, no increase in mortality, and no adverse effect from fumigation of the meal with methyl bromide.

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6.10 FISH MEAL IMPORTS PROMPT APPEAL FOR INTERNATIONAL TALKS

Anonymous
Feedstuffs 32, 62-63 (April 30, 1960)

Three organizations representing the United States fish-meal industry have appealed jointly to the Secretary of State to arrange government-to-government talks with major fish meal-producing countries in an attempt to solve problems of production, distribution, and market conservation. Behind this problem and the appeal is the rapid decline that domestic fish-meal prices have suffered since the latter part of the 1959 fishing season. These low prices have forced some fish-meal processors, in this country, to close down indefinitely and others to curtail production drastically. The United States fish-meal interests place most of the blame for the trouble on a tremendous increase in foreign production and on an expansion in fish-meal imports.

Petitioners.--The formal application to Christian A. Herter, Secretary of State, for calling the conference with certain fish meal- and fish solubles-producing countries, came from the National Fisheries Institute, the Virginia Fishermen's Association, and the Menhaden Advisory Council for the Gulf of Mexico. The nations whose representatives would be called together if the plan were carried out probably would include the United States, Peru, Japan, Canada, South Africa, Denmark, Iceland, Norway, Angola, and Chile.

According to an industry representative, the menhaden industry has been recognized as one of more healthy fishing industries in the United States and, until recently, has never felt a need for aid. Prices during the 1958 season were reasonably satisfactory with fish oil selling for approximately 6¼ cents per pound, fish meal selling for $140 a ton, and solubles selling for $90 a ton.

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6.3 STUDIES ON THE CHEMICAL CONSTITUTION OF AGAR-AGAR
XXI. RE-INVESTIGATION OF METHYLATED AGAROSE OF GELIDIUM AMANSII

Araki, Choji and Hirase, Susumu
Bulletin of the Chemical Society of Japan 33, 291-295 (March 1960)

Introduction.--Araki (1956) has suggested that agar is a mixture of at least two different polysaccharides, one of which is called agarose. Agarose has a linear structure that is composed alternatively of β-D-galactopyranose and 3,6-anhydro-α-L-galactopyranose residues. The structure assigned to the agarose has been based in part on the fact that a complete methanolysis of methylated agarose led to the isolation of methyl 2,4,6-tri-O-methyl-D-galactoside and 2-O-methyl-3,6-anhydro-L-galactose dimethylacetal. The latter fragment was not isolated in sufficient yield to interpret the whole molecule of agarose because the separation of the cleavage fragments was incomplete.

Purpose.--This paper is concerned with the examination of the agarose structure by carefully re-investigating the methanolysis products of methylated agarose prepared from the Gelidium amansii agar.

Experimental.--After complete methanolysis of the methylated polysaccharide with 3 percent methanolic hydrogen chloride, the products were separated into neutral and acidic components by means of ion-exchange resins. The yield of acidic component was too small to be structurally significant. The neutral component, which consisted of a mixture of neutral sugar derivatives, was then fractionated with petroleum ether and chromatographed on columns of charcoal-Celite.

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6.10

During the latter part of the 1959 fishing season, which extends from approximately June 1 to October 15, the price of fish meal began to drop very rapidly so that today it is selling for less than $100 a ton, or a drop in excess of $50 a ton. Solubles have fallen in price to a current value of less than $40 a ton, or a drop of about $50 a ton. In the menhaden business, fish meal and solubles represent about 65 to 75 percent of total sales. The drop in price, therefore, amounted to more than 30 percent for meal and approximately 55 percent for solubles.

Cause of trouble.--The immediate cause is the tremendous increase in foreign production, together with the large imports into this country, and the availability of large foreign supplies, which still are pressing upon United States markets. Peru, in 1955, produced 22,000 tons of fish meal; in 1956, 37,000 tons; in 1957, 78,000 tons; in 1958, 139,000 tons; and in 1959, 300,000 tons. United States production of fish meal during the same years was: 295,000 tons in 1956; 264,000 tons in 1957, 248,000 tons in 1958; and 295,000 tons in 1959.

Importation of fish solubles jumped in volume in 1957, again in 1958, and also in 1959. Current annual imports are about nine times what they were 5 years ago. Denmark is the principal exporter of fish solubles to this country, but in addition, Canada and South Africa export sizeable amounts to the United States. If meal and solubles continue to sell at approximately the same levels as they are now bringing, it is estimated that the selling prices will be from $20 to $30 a ton below the cost of production.

The fish meal industry believes that the talks could advance the use of fish meal as human food instead of restricting it to poultry and animal consumption. The talks also could lead to solutions which would make it unnecessary for countries, which are producing large quantities of meal such as the United States, to establish trade barriers in order to protect their domestic industry.

6.3

Findings.-- The neutral component mixture was found to contain methyl 2-*O*-methyl-3,6-anhydro-β-L-galactopyranoside in addition to the previously isolated 2-*O*-methyl-3,6-anhydro-L-galactose dimethylacetal and methyl 2,4,6-tri-*O*-methyl-D-galactoside. In agreement with Araki's formula for agarose, 2-*O*-methyl-3,6-anhydro-L-galactose derivatives were obtained in molar quantities equivalent to the 2,4,6-tri-*O*-methyl-D-galactose derivative.

Methyl 2-*O*-methyl-3,6-anhydro-β-L-galactopyranoside, a new compound, was obtained as crystals, melting at 67°~69° C. and showing a specific rotation $[\alpha]_D^{25}$ +66° in water. The structure assigned to this compound after hydrolysis was 2-*O*-methyl-3,6-anhydro-L-galactose. Further identification yielded crystalline 2-*O*-methyl-3,6-anhydro-L-galactonic acid and its methyl ester and amide. Further methylation yielded crystalline methyl 2,4-di-*O*-methyl-3,6-anhydro-β-L-galactoside. The presence of the methyl 2-*O*-methyl-3,6-anhydro-β-L-galactopyranoside among the methanolysis products of methylated agarose accounts for the direct origin of methyl 2,4-di-*O*-methyl-3,6-anhydro-β-L-galactoside, which previously had been isolated after methanolysis and subsequent remethylation of the methylated polysaccharide.

If the agarose molecule were branched, however, either methyl di-*O*-methyl-D-galactoside or 3,6-anhydro-L-galactose dimethylacetal or both would be derived from units of branch points when the methylated polysaccharide was subjected to methanolysis. In spite of careful examination, neither of these could be detected among the products of methanolysis that were investigated. The molecule, therefore, appears to be a chain as previously suggested by Araki. The nonreducing end of the chain failed to yield fully methylated component sugars as methanolysis products of the methylated polysaccharide.

5.111

opsin, namely, isorhodopsin, which has an absorption band maximal at 487 mμ.

This reaction was afterwards developed by Hubbard, Gregerman, and Wald (1952 and 1953) as an analytical method for the determination of iso-a and iso-b in the absence of neo-b retinene. The neo-b isomer, the key isomer in the visual process, interferes in this reaction by yielding the pigment rhodopsin, which absorbs at 500 mμ. The interference from neo-b retinene has not complicated studies on fish-liver oils because this isomer has not yet been found outside the eye.

Assays.--Fish-liver oil preparations assayed by the opsin method were the unsaponifiable fractions obtained before and after concentration by molecular distillation from (1) shark-liver oil, (2) cod-liver oil, and (3) distilled cod-liver oil. These samples were saponified, and their vitamin-A isomers were recovered by extraction according to the U.S.P. XV. method. Sterols were separated by crystallization from methanol at -20° C. Isomers were oxidized to their retinenes (1) according to procedures similar to those of Wald (1947 and 1948), but with the aid of manganese dioxide prepared according to Henbest, Jones, and Owen (1957). Of the combined iso-a and iso-b isomers, 19 to 26 percent were present in the vitamin A of these oils. By comparison, a rat-liver oil was found to contain 14 percent of combined iso-a and iso-b vitamin A.

The saponification and oxidation procedures used in the present study to prepare the samples for assay were examined as a source of isomerization.

Nomenclature, structure, and biopotencies of iso-a and iso-b

Trivial name	Stereoisomeric form		Relative biological potency percent	
			Vitamin A acetate	Vitamin A aldehyde (retinene)
	all-trans		100	91
	c*	G**		
iso-a	9-cis	6-cis	21	19
iso-b	9,13-di-cis	2,6-di-cis	24	17

* carotenoid system.

** Geneva system.

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Results from the fifth trial, using 400 poults per treatment, showed that domestic fish meal less than 1-week-old had no significant adverse effect on mortality or the number of culls. The ether extract or fat fraction from stored domestic fish meal appeared to have a less adverse effect on poults than did the meal residue.

Conclusions.-- The mortality pattern of the poults that received fish meal in the five trials was fairly uniform. The number of mortalities, which varied from trial to trial, depended largely on the breeder-flock and the egg-handling of the egg producer. The normal starve-out period for poults on the control diet was usually 5 to 6 days. After this period, mortality decreased. Mortality of the birds that received fish meal throughout each trial continued to the end of the period. Losses were predominantly caused by an increase in the number of culls rather than by mortality.

In general, cull poults not only were dehydrated, but they also appeared to be starved. This may be explained by the fact that poults consumed considerably less of the diets that contained fish meal than they did of the control diet. Stored fish meals from three distinctly different sources were rejected by the poults, whereas the fresh fish meal appeared to be acceptable. This finding indicates that storage adversely affects the acceptance of the meal.

6.30 NEW DELHI SYMPOSIUM ON ALGAE

Fogg, G. E.
Nature 185, 820-821 (March 19, 1960)

The symposium on "Algology", held in the Indian Agricultural Research Institute, New Delhi, during December 7 to 11, under the auspices of Unesco and the Indian Council of Agricultural Research, had the object of stimulating investigations on the more practical aspects of the subject.

The papers presented covered nearly every aspect of modern knowledge of the algae. Classical morphology was represented by papers on the comparative morphology of the Charophytes, by V. S. Sundaralingam, and on reproduction in red algae, by M. S. Balakrishnan, and by a lecture by M. O. P. Iyengar, describing some of the many interesting species that have been discovered in India. Recent advances in the study of the submicroscopic morphology of algae were reviewed by T. V. Desikachary. Papers on algal cytology, which is especially important for the understanding of life cycles and for taxonomy, were given by C. S. P. Rao, Y. S. R. K. Sarma, and Y. B. K. Chowdary.

A paper by H. Tamiya dealt particularly with the role of sulphur in the processes of cell maturation and division. Studies on the mineral nutrition of a Selenastrum were described by K. V. Natarajan. G. E. Fogg presented evidence to show that the liberation of extracellular products is widespread and that enzymes are included among the varied kinds of substances involved. The kinetics of the production of extracellular nitrogenous substances by a nitrogen-fixing Nostoc isolated from the root nodules of Trifolium alexandrinum was discussed by G. S. Venkatataraman. In another paper on nitrogen fixation, G. E. Fogg emphasized the close intermeshing of this process with photosynthesis that occurs in blue-green algae. He also reported on nitrogen fixation by Chlorogloea fritschii. A paper by A. Watanabe dealt with the importance of nitrogen fixing blue-green algae

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7.80 CARBONYL COMPOUNDS IN FISH AS RELATED TO DETERIORATION
1. DETECTION OF VOLATILE CARBONYL COMPOUNDS FORMED IN FISH FLESH

Ota, F.
Bulletin of Japanese Society of Scientific Fisheries 24, No. 5, 334-337 (1958)

Introduction.--Volatile carbonyl compounds are important constituents of odor that are produced when fish flesh is denatured. The author has studied (1) changes in the amounts of volatile carbonyl compounds that are produced in the fish flesh during spoilage and (2) what happens within the flesh. For determining carbonyl compounds, the author selected a quantitative method that is based on the change of color in 2,4-dinitrophenyl-hydrazone to a quinoid-type red on contact with alkali. To avoid organic solvents, which require cumbersome purification, he modified the method so that the distillate of the sample can be used directly.

Distillation of volatile carbonyl compounds.--Place 3 ml. of water into a 50 to 60 ml. long-necked receiving flask. Lower the end of the glass tubing attached to a condenser into the water. Suspend 2 g. of flesh in 5 ml. of water in an 80-ml. microdistillation flask and begin a steam distillation. Distill over about 50 ml. of distillate with the switch in the 0.5-kw. position and then change over to the 1-kw. position and continue the distillation. The total distillation time will be about 10 minutes or until a total of 55 ml. of distillate has been collected. Dilute this amount to 60 ml. with water.

Colorimetric measurement.--Add 0.2 ml. of 0.5 percent 2,4-dinitrophenyl-hydrazine in 2 N HCl to a 5-ml. aliquot of the distillate and heat for 2 minutes at 100° C. Cool in water and then in ice for more than 5 minutes. Add 1 ml. of 5 percent NaOH solution, which has been cooled in ice, and mix well. Hold this mixture in ice for exactly 5 minutes, place in a 10 mm. cell and read within

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 ABSTRACTER. Martin Heerdt

7.520 TURBIDIMETRIC AND TITRIMETRIC METHODS FOR THE MICROBIOLOGICAL DETERMINATION OF AMINO ACIDS: A UNIFICATION OF MATERIALS

McGuire, Joseph J.; Schiaffino, S. S.; and Loy, H. W. (Division of Nutrition, Food and Drug Administration, Department of Health, Education, and Welfare, Washington 25, D. C.)
Journal of the Association of Official Agricultural Chemists 43, 34-37 (February 1960)

Numerous methods are described in the literature to determine natural amino acids. They are based on measurements of growth responses by both titrimetric and turbidimetric techniques and use a variety of organisms and basal media.

Turbidimetric measurements have a shorter incubation period and a greater degree of sensitivity than titrimetric measurements. However, the turbidimetric method is not satisfactory when color or extraneous turbidity is present in the assay solution. Laboratories analyzing a variety of samples, some of which present problems of turbidity interference, would find it of value to be able to substitute one measurement for the other. The present study was designed to correlate the media and organisms used in the microbiological assay of 12 amino acids by titrimetric methods with those used in an assay by turbidimetric methods.

The amino acids and the organisms used for their assays are:

L-Arginine (S. faecalis ATCC 9709), L-cystine (L. mesenteroides, ATCC 8042), L-histidine (L. mesenteroides), L-isoleucine (L. plantarum, ATCC 8014), L-leucine (L. plantarum), L-lysine (L. mesenteroides), L-methionine (L. mesenteroides), L-phenylalanine (L. mesenteroides), L-threonine (L. mesenteroides), L-tryptophan (L. plantarum), L-tyrosine (L. mesenteroides), L-valine (L. plantarum).

Differences in the procedures between the two types of assays are the amounts in the standard tubes of the amino acid being assayed and the 72-hour versus the 18-hour incubation period. The composition of the basal media and the concentrations of stock standard solutions are given in table 1 (see over). The calculations needed to adjust the amino acid levels for the standards for the two methods are given by the authors for each amino acid.

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 ABSTRACTER: Neva L. Karrick

8.0 VARIATIONS IN CHEMICAL COMPOSITION OF DIFFERENT PARTS OF HALIBUT FLESH

Thurston, Claude E. and MacMaster, Patricia P. (U. S. Bureau of Commercial Fisheries, Seattle, Washington)
Food Research 25, 229-236 (March-April 1960)

Introduction.--Great variation exists in the chemical composition of fish flesh. Data included in previous reports by Stansby (1954) and Thurston (1957) indicate that variations in the composition of fish depend on a number of factors including (a) size, (b) sexual maturity, (c) season and area of capture, (d) method of storage, and (e) part of fish from which the sample is taken.

Purpose.--Because no data were available on the composition of large halibut or on the composition of different parts of the same halibut, an intensive study was begun to determine variations in the chemical composition of halibut flesh and to correlate these data with (a) size of the fish, (b) part of the fish from which sample was taken, and (c) manner in which the fish was refrigerated on board the vessel.

Experimental.--Eight iced and 37 frozen specimens of halibut ranging in size from 2 to 95 pounds were collected during the summers of 1957 and 1958, in the area that extends from the north end of Vancouver Island to Kodiak Island. The quantity of halibut included in this study was not adequate for a comparison of the variations in composition with area and season of capture. Since the iced fish had been eviscerated prior to delivery and the viscera of the frozen fish usually were not thawed, no attempt was made to classify the halibut according to sex.

Definition of terms.--Halibut is a flat fish with both eyes on the same (upper) side. Commercial

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 ABSTRACTER: Martin Heerdt

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Table 1.--Composition of the basal media

Ingredients	Conc. of stock sol. (g/L)	Amt./250 ml. basal med. (ml.)
Amino acid solutions:		
L-Arginine HCl	20.0	5
L-Cystine	10.0	5
L-Histidine HCl	20.0	5
L-Isoleucine	5.0	10
L-Leucine	10.0	5
L-Lysine HCl	10.0	5
L-Methionine	5.0	10
L-Phenylalanine	5.0	10
L-Threonine	5.0	10
L-Tryptophan	10.0	5
L-Tyrosine	10.0	10
L-Valine	5.0	10
L-Alanine	5.0	10
L-Asparagine	10.0	5
L-Aspartic Acid	10.0	5
L-Glutamic acid	10.0	25
Glycine	20.0	5
L-Hydroxy proline	20.0	2.5
L-Norleucine	5.0	10
L-Proline	20.0	2.5
L-Serine	5.0	10
Adenine-guanine-uracil sol.	1.0 each	5
Vitamin Soln. 1:		
Thiamine	0.025	
Riboflavin	0.025	
Niacin	0.050	

Ingredients	Conc. of stock sol. (g/L)	Amt./250 ml. basal med. (ml.)
Vitamin Soln 2:		10
Pyridoxal	0.050	
Pyrixamine HCl	0.050	
Calcium pantothenate	0.025	
p-Aminobenzoic acid	0.005	
Biotin	0.00125	1
Folic acid	0.0025	1
Salt solution A:		2.5
K_2HPO_4	100.0	
$KH_2PO_4 \cdot 3H_2O$	131.0	
Salt solution B:		2.5
$MgSO_4 \cdot 7H_2O$	40.0	
NaCl	2.0	
$FeSO_4 \cdot 7H_2O$	2.0	
$MnSO_4 \cdot H_2O$	2.0	

Ingredients	Assay organism	(g.)
Glucose	S. faecalis	5.0
	L. Plantarum	10.0
	L. mesenteroides	10.0
Sodium acetate, anhyd.	L. plantarum	6.0
	L. mesenteroides	6.0
Sodium citrate H_2O	S. faecalis	13.0

8.0 (Cross Reference: 8.4)

cuttings are either longitudinal fillets or cross-sectional steaks. Underneath the skin along the center of each side is a thin layer of dark meat. Evisceration of the fish forms two thin flaps of flesh called belly flaps. The carcass contains a spine with two sets of rib-like bones that occur at right angles to each other. The four quarters of flesh thus formed are called fletches.

Preparation of samples.--Samples were obtained from 10 frozen halibut, each of which was under 5 pounds in weight; from 19 frozen halibut, 5 to 20 pounds in weight; from 8 frozen halibut, 20 to 95 pounds in weight; and from 8 iced halibut, 20 to 95 pounds in weight. Each halibut was washed and measured for length and weight. Samples were removed while the flesh was partially frozen. The weight of each halibut with head and viscera removed was calculated by using factors of 10 percent for the heads and 12 percent for the viscera. Each sample, whether from frozen or iced halibut, was ground in a meat cutter, vacuumed sealed in a $\frac{1}{2}$-pound can, and stored at -28° C. until analyzed. Moisture, oil, protein, ash, sodium, and potassium were assayed by methods of analysis of the A. O. A. C. (1955).

Results.--Fillets, from the 10 frozen halibut under 5 pounds, contained 79.4 percent moisture, 0.6 percent oil, 19.8 percent protein, 1.35 percent ash, 45 mg. of sodium per 100 g., and 430 mg. of potassium per 100 g. Composition data for the 27 frozen and 8 iced halibut of commercial size were tabulated. Major variations appeared in the chemical composition of the dark meat, belly flaps, and fletch tips. Differences in the composition of the right and left sides were not significant except for the oil content. Steak sections were quite uniform in composition and averaged less than 1 percent oil, about 21 percent protein, and about 50 mg. of sodium per 100 g. of fish. Iced halibut were considerably lower in ash, sodium, and potassium than were frozen halibut. Halibut usually is not held in refrigerated brine on board the vessel and is not dipped in brine before it is frozen; therefore, it provides a source of high protein that can be included in sodium-restricted diets.

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that are found almost ubiquitously throughout tropical, subtropical and temperate regions and that evidently contribute materially to the fertility of many soils and rice fields.

H. Tamiya, H. von Witsch, and A. M. Mayer each considered various aspects of the mass culture of microscopic algae such as Chlorella for use as animal or human food. Convincing evidence of the feasibility of large-scale culture was given in a film on the work of the Japan Micro-algae Research Institute. This institute has culture ponds of about an acre in total area, which produce 12 tons dry weight of Chlorella a year. The estimated cost of decolorized algal powder is $1.12 per pound or considerably more than that of cheap protein sources such as soy beans at $0.06 per pound or fish meal at $0.13 per pound but a little less than that of skim milk powder at $1.20 per pound.

The cost of algal culture can be minimized by combining it with the photosynthetic treatment of sewage and organic wastes by the oxidation pond method. A paper submitted from the Sanitary Engineering Laboratory of the University of California gave a resume of this process and reported that algae harvested from oxidation ponds by alum flocculation proved satisfactory as a protein source in the diet of lambs. Field studies on the use of algae in sewage disposal were described by A. Raman.

H. Tamiya gave an account of the use of seaweeds as food in Japan. Among these, the most popular is Porphyra tenera, which is cultivated in shallow seas to the extent of 4,00 to 5,000 tons dry weight per annum and which can command prices of up to $8.00 per pound. A paper by F. Thivy described cottage-industry methods for the preparation of seaweed meal and agar. The ecology and distribution of Indian marine algae were considered in papers by J. N. Misra and K. S. Srinivasan.

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5 minutes in a colorimeter at 500 mμ. If the color is too dark or cloudy, use a smaller portion of the distillate and make up to 5 ml. with water. If cloudiness is encountered, use 2.5 ml. of 2 percent KOH in ethanol in place of the 5 percent NaOH, cool, and read the color after 25 minutes.

Paper chromatography of volatile carbonyl compounds.--Use 5 ml. of the distillate from the steam distillation of the sample. Add hydrazine, as was done in the case of the quantitative analysis, and let the reaction proceed. Cool this mixture, and extract hydrazone with about 2 ml. of refined butanol that is devoid of carbonyl compounds. Concentrate the extract under vacuum. Label as the sample solution. Draw a line on the filter paper where the solvent head will occur or about 20 to 25 cm cm. from one end of the paper. Use petroleum ether saturated with anhydrous methanol as a solvent. Develop for about 2 hours, spray with 10 percent NaOH solution. Compare the red spots with the standard. For a sample that contains small amounts of volatile carbonyl compounds, add only 0.1 ml. of hydrazine to 5 ml. of distillate. Prepare two or three chromatograms, combine all of the butanol extracts from these chromatograms and concentrate the extracts.

Results.--Fillets of fresh mackerel, sardine, carp, and various portions of mackerel were macerated. Other similar fillets were not macerated. All were held at room temperature to observe the changes in the amount of volatile carbonyl compounds during storage. Volatile carbonyl compounds, which were nearly negligible in fresh fish, increased from 1 to 3 mg. as the time in storage increased. Volatile carbonyl compounds in very spoiled fish had a tendency to decrease. The amount produced in the macerated flesh and in the dark meat was greater than that produced in the unmacerated flesh and in the ordinary meat. The amount of volatile carbonyl compounds in the various tissues increased in the following order: organs, skin, and flesh. Volatile carbonyl compounds probably contribute to spoilage odors. Paper chromatography was of value for detecting acetaldehyde in fresh mackerel, sardine, and sole. In spoiled fish, acetaldehyde was quite obvious. In the fish that had been stored for a long time, butyl aldehyde was present. The volatile carbonyl compounds consisted mainly of volatile aldehydes.

8.43 ANIMAL PHYSIOLOGY WATER CONTENT OF COD (GADUS CALLARIAS L.) MUSCLE

Love, R. M. (Torry Research Station, Aberdeen, Scotland)
Nature 185, 692 (March 5, 1960)

Introduction. --In fatty fish such as herring the protein content of the flesh does not show a regular cycle of change throughout the year. The fat content of the flesh, however, decreases in times of food scarcity; and the flesh shows a corresponding increase in water content. Nonfatty fish such as cod do not behave in this way. In times of scarcity they draw on their body proteins both for metabolic purposes and for building up the gonads. Water then takes the place of the protein that has been used elsewhere. Cod artifically starved to the point of death can increase their water content to as much as 88 percent of the flesh as compared with about 80.5 percent in normal fish.

Although many determinations of the water content of fish muscle have been made, the rather small variations encountered in nonfatty fish landed at commercial ports rarely have been discussed. The results obtained in this study, however, show that considerable biological information can be obtained.

Experimental. -- All cod analyzed were obtained from the same ground, about 30 miles southeast of Aberdeen. They were filleted within 12 hours after being caught, and myotome numbers 8 to 16 approximately, counting from the anterior end of the fillets, were dissected out free from myocommata (connective tissue) and placed in weighed basins. Approximately equal weights of material were taken from each fish in a sample. Water was determined by drying in an oven at 100° C. for 7 days.

The three size-groups of fish used were: group 1, 20 inches long or less and sexually immature;

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 ABSTRACTER: Martin Heerdt

8.7 VOLUNTARY STANDARDS - - A REVIEW OF FISHERY PRODUCTS STANDARDS AND INSPECTION SERVICES

Anonymous
Fishing Gazette Annual Review 77, 72-73 (1960)

With the cooperation of the National Fisheries Institute and the Bureau of Commercial Fisheries, the fishing industry in 1954 adopted its program for voluntary standards, inspection and certification for fishery products. The more progressive members of the industry realized that this powerful marketing tool which had proved so successful in other food fields, would open up new markets for their products.

In April of 1956, after close cooperation with the industry, the first Federal standard for a fishery product was promulgated in the Federal Register--U. S. Standards for Grades of Frozen Fried Fish Sticks. One month later, Gorton's of Gloucester, Inc. contracted for continuous in-plant inspection with the U. S. Department of Agriculture, thus becoming the first U. S. fish processing plant to offer graded and certified fishery products to the American consumer. Within a short time five more plants contracted for continuous inspection. In March 1958, two more Federal standards were promulgated--U. S. Standards for Grades of Frozen Raw Breaded Shrimp and Frozen Fish Blocks.

In July 1958, the responsibility for the promulgation of Federal Standards and the operation of an inspection and certification service for fishery products was transferred from the Agricultural Marketing Service, U. S. Department of Agriculture, to the Bureau of Commercial Fisheries, U. S. Department of the Interior.

The Bureau inherited three Federal Standards and six plants under continuous inspection from the USDA. Seventeen months later there were five Federal Standards. U. S. Standards for Grades of Frozen Haddock Fillets and Frozen Halibut Steaks were added in 1959 and 22 more plants contracted for continuous in-plant inspection. In the Breaded Shrimp Industry, the Bureau has contracts with 13 plants which process approximately 80 percent of this product produced in this country.

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8.51 THE AMINO ACID COMPOSITION OF SOME FISH COLLAGENS: THE RELATION BETWEEN COMPOSITION AND STRUCTURE

Piez, Karl A. and Gross, Jerome (United States Department of Health, Education and Welfare, Bethesda, Maryland)
Journal of Biological Chemistry 235, 995-998 (April 1960)

Introduction. --According to a hypothesis of the authors the pyrrolidine rings of the imino acids play an important role in the intramolecular stability of collagen by virtue of their ability to stabilize the secondary structure, whereas intermolecular strength may be, in part, the result of hydrogen bonding by the hydroxy groups of hydroxyproline, serine, threonine, and possibly hydroxy-lysine. This requires that all hydroxy groups form equally strong hydrogen bonds and suggests that collagen II rather than collagen I is the predominant form. This communication presents complete amino acid analyses of five fish collagens not previously analyzed and summarizes other data from the literature in support of the authors' hypothesis.

Experimental. -- Collagens from the scales, skin, and swim bladder of the carp, cod skin, and pike skin were used. Carp swim-bladder collagen was prepared by extraction with 0.1 M citrate at pH 3.5. Extraction was followed by dialysis of the supernatant fluid against water at 5° C. The precipitated collagen was isolated by centrifugation, redissolved, precipitated two additional times, and lyophilized in a water suspension. The other collagens were isolated as gelatins by (1) autoclaving the thoroughly washed and lipid-extracted tissue in water overnight, (2) dialyzing, and (3) lyophilizing. Hydrolyzates were prepared by sealing 10 mg. of protein and 5 ml. of triple-distilled 6 N HCl in a glass tube, heating the tube for 24 hours at 105° C., evaporating the contents of the tube to a syrup, and diluting the contents to 5 ml. with water. The amino acids in 1 ml. of this solution were assayed by ion exchange chromatography with the aid of an automatic instrument.

Results. --Fish collagens are similar to others of this group. The authors also demonstrated that variation in the shrinkage temperature of vertebrate collagens is more exactly described as a function of the total number of imino acid residues rather than hydroxyproline residues alone.

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 ABSTRACTER: Martin Heerdt

8.8 CYSTINE AND TOTAL SYLFHYDRYL CONTENT OF UNSPOILED AND SPOILED SHRIMP

Kurtzman, Caroline H.; Snyder, Donald G.; and Nilson, Hugo W. (Fisheries Technological Laboratory, College Park, Maryland)
Food Research 25, 237-244 (March-April 1960)

Introduction. --Chemical indices to determine the extent of spoilage in fish have been used primarily in attempts to correlate the degree of spoilage with the amounts of intermediate and end products of fish-tissue decomposition such as trimethyalmine, ammonia, volatile acids, indole, skatole, and others. In general, the content of these substances has been found to increase in fishery products undergoing spoilage. The authors question whether these increases are measurable and whether they indicate a degree of spoilage during an early stage or indicate the onset of spoilage before it can be detected organoleptically. A test to measure the disappearance of constituent substances from fish tissues during spoilage probably would provide a more logical basis for such an index.

Chemical studies have indicated that hydrogen sulfide and sulfhydryl-containing compounds increase in fishery products as a result of spoilage. In a search for some substance in fish tissue that could be used to evaluate spoilage, the authors chose cystine because its S-S bonds, which join peptide chains, are quite labile. The authors also decided to correlate cystine with any increase in the amount of total sulfhydryl groups during spoilage.

Purpose. --The present study was made (1) to determine changes in total nitrogen, free ammoniacal nitrogen, total aerobic bacterial-plate count, total sulfhydryl groups, and cystine in unspoiled and in spoiled shrimp, and (2) to evaluate the hypothesis that a test to measure the disappearance of

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 ABSTRACTER: Martin Heerdt

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Table 1.--Amino acidscomposition of fish collagens (Residues of amino acid per 1000 total residues)

	Carp scale gelatin	Carp swim bladder collagen	Carp skin gelatin	Cod skin gelatin	Pike skin gelatin	Calf skin collagen
Glycine	326	325	317	345	328	320
Alanine	119	126	120	107	114	112
Valine	18	18	19	19	18	20
Isoleucine	11	10	12	11	9.2	11
Leucine	22	21	25	23	20	25
Proline	117	116	124	102	129	138
Hydroxyproline	82	81	73	53	70	94
Phenylalanine	14	14	14	13	14	13
Tyrosine	3.3	2.0	3.2	3.5	1.8	2.6
Serine*	43	37	43	69	41	36
Threonine	25	29	27	25	25	18
Methionine	14	13	12	13	12	4.3
Cystine	1	1	1	1	1	1
Hydroxylysine	7.1	7.4	4.5	6.0	7.9	7.4
Lysine	25	26	27	25	22	27
Histidine	5.2	3.8	4.5	7.5	7.4	5.0
Arginine	52	53	53	51	45	50
Aspartic acid	48	47	47	52	54	45
Glutamic acid	69	71	74	75	81	72
Amide N	(30)	(38)	(26)	(33)	(42)	(46)
Shrinkage temp., °C.		54	57	40	55	65

* Corrected for an assumed loss during hydrolysis of 5 percent. Corrected for an assumed loss during hydrolysis of 3 percent. Total of methionine and methionine sulfoxide.

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a constituent unit of fresh fish tissue would be a more sensitive chemical index of quality than a test to measure an increase of intermediate and end products during spoilage. A possible decrease in the content of cystine might be an index of shrimp quality.

Experimental.--Commercial pink shrimp (Penaeus duorarum) used in this study were caught near the Tortugas Islands in the Gulf of Mexico. The shrimp were frozen immediately upon landing and sent by air express to the authors' laboratory, where they were stored at -15° C. in moisture-proof containers. Testing was begun immediately.

Findings.--Results obtained from this study showed an increase in the total sulfhydryl content of spoiled shrimp and verified results obtained by others. The results further indicate, however, that this increase can be entirely accounted for by a concomitant increase that was obtained in the cystine content of the spoiled shrimp.

Assays of free ammoniacal nitrogen indicate that some degree of decomposition of protein or of other nitrogen-containing compounds occurred during spoilage. Determination of total plate counts indicate that the bacterial population was nearly 500-fold greater in the spoiled than in the unspoiled shrimp. These results suggest a possibility that the tissue protein of the shrimp may not be decomposing to produce the well-known indications of spoilage, at least up to the stage that was studied here. The results also suggest a possibility that the increased bacterial population may be responsible for the increase in cystine and ammoniacal nitrogen of the spoiled shrimp. The results suggest that protein denaturation, decomposition products possibly from fats and sugars, and free nitrogen-containing compounds such as amino acids may give subjective sensations that are attributed to the stage of spoilage of shrimp herein described.

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group 2, close to 30 inches long or about the size when they become mature; and group 3, 36 to 42 inches long or mature. Fish in group 3 were difficult to obtain, therefore, each sample contained from 1 to 8 fish. Group 2 samples always contained 10 fish, whereas group 1 samples always contained 20 fish.

Results.--The water content of the cod was affected by the size of the fish as well as by the season of the year. A maximum water content in March corresponded with the period of spawning. Not only was tissue hydration greater in large fish than in small fish, but in addition, it lasted longer. Group 1 fish were affected for just 1 month. Their recovery in April was from an effect that probably was due solely to starvation since these fish were immature. The findings are in accordance with previous observations of Ironsides and Love (1958), who showed that the reduction in protein nitrogen was greater in large fish than in small fish. They explained the loss of protein nitrogen as an additional need that caused large fish to build up gonads on a food supply inadequate even for ordinary metabolism.

Maximum water content for a given location depends on the place where the fish were caught and probably on the year in which they were caught as well. The highest water content ever found under natural conditions, 87.2 percent, occurred in a cod 42 inches long that was caught off the west coast of Scotland in early June 1959. This isolated observation provides an example of the effect of a different fishing ground, since the maximum for 1959 off the southeast coast of Aberdeen occurred in March. The author recommends assays at monthly intervals for a year on fish from the same fishing ground and of at least two age groups to obtain a complete perspective of the variations in a given constituent. The data support this recommendation.

8.7

In order to present a well-balanced quality control program to benefit the entire fishing industry, the Bureau has developed a three-pronged program: (1) Prestandards education and product-quality guidelines, (2) Standardization of fishery products, and (3) Inspection and certification of fishery products.

Prestandard education.--The Bureau has undertaken a prestandards educational program to aid the fisherman. The Bureau realizes that quality control must begin at sea as soon as the catch is landed. The fisherman should use the best methods developed through the years to maintain the quality of what is a highly perishable product. Through contracts with several States, trained personnel have accompanied vessels to sea and have demonstrated to the fishermen the proper means and methods of handling fish under commercial conditions. These demonstrators, upon return to port, make a written report to the vessel owners recommending methods by which the sanitary aspect of the vessels' operation can be improved. This program of demonstration is followed by the National Fisheries Institute and its Division of Technology under the terms of their contract with the Bureau. They have developed product-quality guidelines which have been posted in plants and on vessels throughout the country to further aid the fisherman and processor to maintain high quality.

Development of standards.--The Bureau with the close cooperation of the industry has developed the five Federal Standards listed previously. At the present time, the U. S. Standard for Grades of Frozen Cod Fillets are in the process of promulgation. The Bureau's Technological Laboratories are now developing Federal Voluntary Standards for Grades of Frozen Breaded Fish Portions, Frozen Salmon Steaks, Frozen Ocean Perch Fillets, Frozen Raw Headless Shrimp, and Frozen Raw Breaded Scallops.

In the near future, plans call for the development of the standards for frozen fried fish portions, frozen whole dressed salmon, frozen fried scallops, frozen flounder fillets, frozen peeled and deveined shrimp and several other fishery products. The Bureau intends, with the help of the industry, to promulgate a standard for each major fishery product.

Inspection and certification.--Inspection and Certification involves the study of the product and certification by a trained Government inspector that the product meets the established requirements of the standards. From January 1959 to September 30, 1959, 32 inspectors in 28 plants have inspected, graded, and certified 72 million pounds of fishery products.

0.34 OMMOCHROMES. XIII. ISOLATION AND CHARACTERIZATION OF OMMINS

Butenandt, Adolf; Biekert, Ernst; and Linzen, Bernt (Max-Planck-Inst., Munich, Ger.)
Chemical Abstracts 53, 10580f (June 10, 1959)

0.34 DEAMINATION OF ADENOSINE AND ADENYLIC ACID IN THE CLAM MERETRIX MERETRIX LUSORIA

Aikawa, Toyo (Univ. Chiba)
Chemical Abstracts 53, 22532a (November 25, 1959)

0.34 RESPONSE OF FISH SCALE MELANOPHORE TO MODIFICATION OF IONIC COMPOSITION

Iwata, Kiyotsugu Seiji and Yamane, Hideo (Univ. Okayama)
Chemical Abstracts 54, 9134h (May 10, 1960)

1.2 RUSTY HERRING

Harrison, F. C.
Contributions to Canadian Biology 1, No. 10-18, 279-284 (1923)

(Abstract of this article appears under 2.01 page 1 - November 1958)

1.2 A SPECIFIC GRAVITY METHOD FOR DETERMINING FITNESS (CONDITION) IN HERRING (CLUPEA PALLASII)

Tester, Albert
Journal of the Fisheries Research Board of Canada 4, No. 5, 461-471 (February 1940)

(Abstract of this article appears under 7.53 page 17 - June 1960)

1.89 (Cross Reference: 1.80)

POLAROGRAPHIC STUDIES ON THE MOLLUSCAN MEAT II.

Fukushima, Kiyoshi; Kikuchi, Takeaki; Osakabe, Isami; and Okada, Ikunosuke
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 2, 144-147 (1958)

In a former paper, the authors found a new polarographic reduction wave length which is peculiar to the muscles of mollusca and crustacea. The present experiments showed that the reduction wave characteristic of cuttlefish meat is an organic base.

1.89 STUDIES ON THE MUSCLE PROTEINS OF THE SQUID

Matsumoto, Juichiro J.
Bulletin of the Tokai Regional Fisheries Research Laboratory No. 23, 51-63 (February 1960)

(Abstract of this article appears under 0.321 page 1 - June 1960)

1.953 BIOCHEMICAL CONDITION OF WHALEMEAT BEFORE OR AFTER FREEZING AND COLD STORAGE OF FROZEN MEAT

Tanaka, Kazuo and Tanaka, Takeo
Journal of the Tokyo University of Fisheries 42, No. 1, 83-88 (1956)

(Abstract of this article appears under 3.2495 page 11 - July 1960)

1.953 NEWFOUNDLAND WHALING

Woodland, Bruce
Trade News 12, 3-4 (October 1959)

1.953 USING SPERM-WHALE BLUBBER AS SOLE SOURCE OF CARBON FOR PRODUCING STREPTOMYCIN

Surikova, E. I. and Nenasheva, A. M. (All-Union Research Inst. Antibiotics, Moscow)
Chemical Abstracts 53, 22750d (November 25, 1959)

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
Thread		Clupea pallasii (Pacific)
		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		Callinectes sapidus
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Cancer magister
Dungeness		Paralithodes camtschatica
King	Alaska king crab	Cancer irroratus (New England)
Rock		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri (Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)

Common name	Other common names	Scientific name
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

2.1126 RESULTS OF FISHING EXPERIMENTS WITH TRINAL GILL NETS

Nakamura, Hideo and Kawasaki, Giichi
Bulletin of the Faculty of Fisheries, Hokkaido University 10, 123-130 (August 1959) (Hakadote, Japan) (English abstract, figures, and tables)

Synthetic fiber, trinal gill nets catch fish faster than do bottom gill nets of cotton twine in a fast tidal current. Mesh size in the range 6.7 centimeters to 9.1 centimeters is the most suitable for the inside part of a trinal gill net when the net is used for catching rockfish, greenling, and sole. Cotton twine nets appeared to be unsatisfactory for the trinal gill net. Dyed nets yield better catches than do undyed nets.

2.1126 THE MEASUREMENTS OF TENSION ON THE SALMON DRIFT NET I.

Kondo, Yasusi and Suzuki, Makoto
Bulletin of the Japanese Society of Scientific Fisheries 25, 346-350 (September 1959) (English abstract, and figures)

Tension on a salmon drift net in still water was measured with a strain gauge.

2.116 ECHO-RANGING IN FISHING--THE REAL OPPORTUNITY LIES IN THE FUTURE

Anonymous
Pacific Fisherman 58, 20, 23 (February 1960)

2.117 USE OF ALUMINUM FOILS FOR THE INSULATION OF TRAWLER HOLDS EQUIPPED WITH REFRIGERATING PLANTS

Legenk, M. G.
Rybnoe Hozjajstvo. U.S.S.R. No. 1, 35-37 (Jan. 1959)
Bulletin de L'Institut International du Froid 39, No. 6, No. 7905 (1959) (Paris)

2.118 RECENT DEVELOPMENTS IN PROPULSION MACHINERY AND FREEZING EQUIPMENT FOR DEEP-SEA TRAWLERS

Eddie, G. C.
Shipbuilder and Marine Engine Builder, pp. 3-8 (May 1958)
Bulletin de L'Institut du Froid 39, 1444-1446 (1959) (Paris)

Diesel-electric propulsion appears to provide economical trawler operation under all conditions of service. The fast diesel-electric vessels allow for flexibility and provide more space for quick-freezing equipment; the combination of these two developments offer an escape from the limitations imposed by the orthodox steam propulsion units and by the preservation of fish by icing.

2.143 A DIRECT-CURRENT ELECTROFISHING APPARATUS USING SEPARATE EXCITATION

Murray, A. R.
Canadian Fish Culturist No. 23, 27-32 (1958)
Sport Fishery Abstracts 4, Abstract No. 2198 (January 1960)

The unit is described and a brief report on some results of its use is given.

2.143 A PORTABLE CONDUCTIVITY METER FOR USE WITH ELECTROFISHING GEAR

Thompson, Richard B. and Van Haagen, Richard H. (Fisheries Instrumentation Laboratory, Bureau of Commercial Fisheries, Seattle, Washington)
Progressive Fish-Culturist 22, 63 (April 1960)

3.12 TUBE ICE FACTORY

Anonymous
Can. Refrign. Air Condg., Can. 25, 28-30 (April 1959)
Bulletin de L'Institut International du Froid 39, No. 6, No. 7886 (1959) (Paris)

A new factory has recently been completed to supply ice for fishing vessels based in Hamburg. The new factory has an output of 300 tons per day. To reduce handling costs, the ice is produced in the form of hollow cylinders with an outside diameter of about 40 mm., a wall thickness of 14 mm., and a length of 40 mm. In this form the ice does not agglomerate to the same extent as crushed, block ice, and can therefore be handled like any bulk commodity.

3.12 EFFECTIVENESS OF TETRACYCLINES TREATMENT ON QUALITY IMPROVEMENT OF PROCESSED FOODS II. QUALITY IMPROVEMENT AND CHLORTETRACYCLINE RESIDUE OF SALT SALMON DUE TO CTC-TREATMENT

Tomiyama, Tetuo and Yone, Yasuo
Bulletin of the Japanese Society of Scientific Fisheries 25, No. 1, 67-71 (1959) (English abstract, figures, and tables)

The penetration of CTC into semidressed sockeye salmon that were treated with salt containing 21 p.p.m. of CTC was higher in the belly cavity than in the back and tail flesh. CTC in various parts of salmon flesh became inactivated rather readily during storage at 0° to 5°C. The CTC residue in salted chum salmon that had been dipped for 30 minutes in sea water containing 56 p.p.m. of CTC prior to salting was less than 0.1 p.p.m. after 9 months of storage.

ADDRESSES OF PUBLICATIONS ABSTRACTED FOR COMMERCIAL FISHERIES ABSTRACTS

DOMESTIC PUBLICATIONS

Analytical Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Archives of Biochemistry & Biophysics
Academic Press, Inc.
Prince & Lemon Streets
Lancaster, Pennsylvania

ASHRAE Journal
American Society of Refrigerating and Air-Conditioning Engineers, Inc.
234 Fifth Avenue
New York 1, New York

California Fish and Game
Editor
Department of Fish and Game
722 Capitol Avenue
Sacramento 14, California

Chemical Abstracts
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Chemical and Engineering News
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Chemical Engineering
McGraw-Hill Publishing Co.
330 W. 42nd Street
New York, New York

Chemical Processing
Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

Commercial Fisheries Review
Director, Bureau of Commercial Fisheries
Division of Industrial Research and Services
Fish and Wildlife Service
Department of the Interior
Washington 25, D. C.

Drug and Cosmetic Industry
Drug Markets, Inc.
101 W. 31st Street
New York, New York

Federation Proceedings
Federation of American Societies for Experimental Biology
9650 Wisconsin Street
Washington 14, D. C.

Feed Bag, The
Editorial Service Company
1712 West St. Paul Avenue
Milwaukee 3, Wisconsin

Feedstuffs
Miller Publishing Co.
118 South 6th Street
Minneapolis 2, Minnesota

Fish Boat, The
H. L. Peace Publications
624 Gravier Street
New Orleans 12, Louisiana

Fishing Gazette
Fishing Gazette Publishing Corp.
461 Eighth Avenue
New York, New York

Food Engineering
McGraw-Hill Publishing Co., Inc.
330 W. 42nd Street
New York 18, New York

Food Processing
Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

Food Research
The Garrard Press
510 North Hickory Street
Champaign, Illinois

Food Technology
Institute of Food Technologists
11606 South Bell Avenue
Chicago 43, Illinois

Frosted Food Field
Frosted Food Field, Inc.
19 W. 44th Street
New York 18, New York

Industrial and Engineering Chemistry
American Chemical Society
1155 - 16th Street, N. W.
Washington 6, D. C.

Industrial Refrigeration
Nickerson & Collins Co.
433-435 N. Waller Avenue
Chicago, Illinois

Journal of Agricultural and Food Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Journal of the American Chemical Society
American Chemical Society
1155 - 16th Street, N. W.
Washington 6, D. C.

Journal of the American Dietetic Association
American Dietetic Association
620 North Michigan Avenue
Chicago 11, Illinois

Journal of the American Oil Chemists' Society
The American Oil Chemists' Society
35 E. Wacker Drive
Chicago 1, Illinois

Journal of the Association of Official Agricultural Chemists
Association of Official Agricultural Chemists
P. O. Box 540
Benjamin Franklin Station
Washington, D. C.

Journal of Biological Chemistry
The American Society of Biological Chemists, Inc.
Mt. Royal & Guilford Avenues
Baltimore, Maryland

Journal of Nutrition
The Wistar Institute of Anatomy & Biology
36th St. at Spruce
Philadelphia 4, Pennsylvania

Journal of Organic Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Maine Coast Fisherman
Maine Coast Fisherman, Inc.
Belfast, Maine

Modern Packaging
Modern Packaging Corporation
575 Madison Avenue
New York 22, New York

National Fisherman
Atlantic Fisherman, Inc.
Goffstown, New Hampshire

National Provisioner
National Provisioner, Inc.
15 W. Huron Street
Chicago 10, Illinois

Nutrition Reviews
Nutrition Foundation, Inc.
99 Park Avenue
New York 16, New York

Pacific Fisherman
Miller Freeman Publishing, Inc.
500 Howard Street
San Francisco 5, California

Poultry Science
Poultry Science Association
Kansas State College
Manhattan, Kansas

Progressive Fish-Culturist
U. S. Department of the Interior
Bureau of Sport Fisheries and Wildlife
Fish and Wildlife Service
Washington 25, D. C.

Quick Frozen Foods
E. W. Williams Publishing, Inc.
82 Wall Street
New York 5, New York

Science
American Association for the Advancement of Science at the Business Press
1515 Massachusetts Avenue, N. W.
Washington 5, D. C.

Seafood Merchandising
H. L. Peace Publications
624 Gravier Street
New Orleans 9, Louisiana

Western Canner/Packer
The Canner Publishing Co.
817 West Market Street
Louisville, Kentucky

Western Feed & Seed
Western States Publications
320 Market Street
San Francisco 11, California

FOREIGN PUBLICATIONS

Analyst, The
14 Belgrave Square
London, S. W., 1, England

Annual Report of the Fisheries Research Board of Canada
Fisheries Research Board of Canada
Ottawa, Ontario, Canada

Biochemical Journal, The
Cambridge University Press
Bentley House
200 Euston Road
London, N. W., 1, England

Biochemistry (Publication of the Academy of Science of the USSR)
Consultants Bureau, Inc.
227 W. 17th Street
New York 11, New York

Bulletin of the Japanese Society of Scientific Fisheries
Japanese Society of Scientific Fisheries
c/o Tokyo Suisan Daigaku
Shiba-kaigandori 6-Chome
Tokyo, Japan

Bulletin of the Faculty of Fisheries, Hokkaido University
Faculty of Fisheries
Hokkaido University
Hakadote, Japan

Canadian Fisherman
National Business Publications, Ltd.
Gardenvale, Quebec, Canada

Canadian Journal of Biochemistry & Physiology
Division of Administration and Awards
National Research Council
Ottawa 2, Ontario, Canada

Canadian Journal of Chemical Engineering
The Chemical Institute of Canada
18 Rideau Street
Ottawa 2, Ontario, Canada

Canadian Journal of Chemistry
Division of Administration and Awards
National Research Council
Ottawa 2, Ontario, Canada

Chemistry & Industry
14 Belgrave Square
London, W., 1, England

Fette-Seifen-Anstrichmittel
Industrieverlag von Hernhaussen KG
Hamburg 11, West Germany

Fisheries Newsletter
Commonwealth Director of Fisheries, Department of Primary Industry
Canberra, Australia

Food Manufacture
Leonard Hill, Ltd.
Eden Street
London, N. W., 1, England

Food Preservation Quarterly
Division of Food Preservation and Transport
Commonwealth Scientific and Industrial Research Organization
Sydney, Australia

Journal of Applied Chemistry
The Society of Chemical Industry
14 Belgrave Square
London, S. W., 1, England

Journal of the Fisheries Research Board of Canada
University of Toronto Press
Ottawa, Ontario, Canada

Journal of the Science of Food and Agriculture
The Society of Chemical Industry
14 Belgrave Square
London, S. W., 1, England

Modern Refrigeration
Maclaren House
131 Great Suffolk Street
London, S. E., 1, England

Nature
MacMillan & Co., Ltd.
St. Martin's Street
London, W. C., 2, England

Norwegian Fishing News
Kaigaten 8
P. O. Box 222
Bergen, Norway

Progress Reports of Atlantic Coast Stations
Fisheries Research Board of Can.
St. Andrews, New Brunswick, Can.

Progress Reports of Pacific Coast Stations
Technological Station
898 Richards Street
Vancouver 2, B. C., Canada

Report of the Food Investigation Board (Great Britain)
Department of Scientific and Industrial Research
Charles House
5-11 Regent Street
London, S. W., 1, England

Trade News
Director of Information and Educational Service
Department of Fisheries
Ottawa, Ontario, Canada

Western Fisheries
Roy Wrigley Publications, Ltd.
1104 Hornby Street
Vancouver 1, B. C., Canada

World Fisheries Abstracts
FAO Fisheries Division
Technology Branch
Viale delle Terme di Caracalla
Rome, Italy

World Fishing
John Trundell, Ltd.
St. Richards House
Eversholt Street
London, N. W., 1, England

3.19 CHEMICAL AND ORGANOLEPTIC CHANGES IN MEAT EXPOSED TO γ-RAYS

Groninger, H. S.; Tappel, A. L.; and Knapp, F. W.
Chemical Abstracts 54, 4955i (March 10, 1960)

3.19 (Cross Reference: 0.322)

PRODUCTS OF γ-IRRADIATION OF CYSTEINE AND CYSTINE

Markakis, Pericles and Tappel, A. L. (University of California)
Journal of the American Chemical Society 82, 1613-1617 (April 5, 1960)

Cysteine and cystine in aqueous acidic solutions were exposed in the absence and presence of oxygen, to γ-irradiation, at doses varying from 10^4 to $8x10^7$ rad. Cystine, hydrogen sulfide, free sulfur, sulfate ion, ammonia, and alanine were identified and determined among the irradiation products of cystine; more than 80 percent of the sulfur and more than 90 percent of the nitrogen of cysteine could be accounted for. Qualitatively, the irradiated cystine solutions did not differ essentially from the irradiated cysteine solution.

3.235 STUDIES ON THE MICROBIOLOGICAL QUALITY OF PRECOOKED FROZEN MEALS

Huber, D. A.; Zaborowski, H.; and Rayman, Morton M. (QM Food and Container Institute for the Armed Forces, Chicago, Illinois)
Food Technology 12, 190-194 (April 1958)

Bacteriological standards established for the military specification include a standard plate count maximum of 100,000 organisms per gram and a coliform plate count of less than 10 organisms per gram.

3.235 (Cross Reference: 2.01)

ENTEROCOCCUS: COLIFORM RATIOS IN FROZEN CHICKEN PIES

Hartman, Paul A. (Department of Bacteriology, Iowa State University, Ames)
Applied Microbiology 8, 114-116 (March 1960)

In freshly frozen chicken pies, enterococcus counts were more closely related to total counts than to coliform counts, whereas coliform counts were more closely related to enterococcus counts than to total counts. Coliform counts were diminished in pies purchased from retail stores, and coliform counts on such products could no longer be related to either enterococcus or total counts. Unusual ratios of the above counts to one another in pies from selected processors could not be attributed to inhibition of Escherichia coli by the products themselves.

3.24 FROZEN QUALITY - - HOW PROTECT IT?

Kelsey, Robert J.
Food Engineering 28, 50 (September 1956)

(Abstract of this article appears under 3.26 page 15 - April 1957)

3.24 SHRINKAGE DURING CHILLING, FREEZING, AND STORAGE OF MEAT

Hicks, E. W. (Division of Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W.)
Food Preservation Quarterly 17, 7-10 (March 1957)

The main factor affecting water loss in frozen storage is the relative humidity of the store.

4.91 SERUM CHOLESTEROL DEPRESSIVE EFFECT OF LINOLEIC, LINOLENIC, ACIDS AND OF COD-LIVER OIL EXPERIMENTAL HYPERCHOLESTEROLEMIC RATS

Hauge, Jens G. and Nicolaysen, Ragnar (Univ. Oslo, Norway)
Chemical Abstracts 53, 11557f (June 25, 1959)

4.91 INHIBITION OF CHICKEN GROWTH BY CHOLESTEROL AND SATURATED FATTY ACIDS (SFA) AND REVERSAL BY A SOURCE OF UNSATURATED FATTY ACIDS (UFA)

Machlin, L. J. and Gordon, R. S. (Monsanto Chemical Company, St. Louis, Missouri)
Federation Proceedings 19, Part I, 222 (March 1960)

A growth response to a source of unsaturated fatty acids was observed in 2-week-old chicks that had received a basal purified diet, which contained 1 percent methyl myristate, 21 percent casein, 5 percent glutamic acid, and 2.0 percent glycine. Dietary cholesterol increased plasma cholesterol from 183 mg. percent to 361 mg. percent in chicks that received the basal diet, and from 165 mg. percent to 1,316 mg. percent in chicks that received 8 percent saturated fatty acids. The authors concluded that unsaturated fatty acids can reverse the inhibition resulting from dietary saturated fatty acids or from cholesterol fed with dietary saturated fatty acids.

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6.32 SOME EXPERIMENTAL NOTES ON THE REDUCING SUGAR IN "ASAKUSANORI" (PORPHYRA TENERA)

Yamasaki, Hiroshi (Shizuoka Prefectural Fisheries Experimental Station, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 12, 961-965 (1959) (English abstract, figures, and tables)

The present study has been made to determine the amount of reducing sugar in the laver under different conditions of culturing or processing.

6.32 SOME PROPERTIES OF CYTOCHROME C FROM PORPHYRA TENERA

Hashimoto, Kanehisa and Masuhiro, Ikuko
Bulletin of the Japanese Society of Scientific Fisheries 25, 561-564 (November 1959) (English abstract, figures, and table)

6.32 BIOCHEMICAL STUDIES ON THE EDIBLE SEAWEED, PORPHYRA TENERA I. CONTENTS OF VARIOUS NITROGENOUS COMPONENTS IN THE FROND AS AFFECTED BY THE TYPE OF THE NITROGEN SOURCE

Sato, Shiro; Sato, Yoshikazu; Ito, Keiji; and Matsumoto, Fumio
Bulletin of the Japanese Society of Scientific Fisheries 25, 661-666 (December 1959) (English abstract, tables, and figures)

With ammonium salts as a source of nitrogen (N), total N, extracted N, and alanine increased very rapidly. With sodium nitrate as a source of nitrogen, total N did not increase as rapidly as with ammonium salts. The absorption of nitrogen from urea was slow for the first 4 days and very rapid thereafter.

7.595 PROCEDURE FOR DETERMINATION OF ETHOXYQUIN (SANTOQUIN) IN FEEDS

Gordon, Richard S. (Organic Research Department, Monsanto Chemical Co., St. Louis, Missouri)
Journal of the Association of Official Agricultural Chemists 43, 332-334 (May 1960)

A satisfactory method for the determination of ethoxyquin in mixed feed has been developed. This procedure is under investigation in a collaborative study with the object of confirming its usefulness and with the further object of submitting the method for eventual adoption by the AOAC.

7.595 (Cross Reference: 4.64)

THE DETERMINATION OF CHEMICAL ANTIOXIDANTS IN FATS AFTER SEPARATION BY PARTITION CHROMATOGRAPHY

Berger, K. G.; Sylvester, N. D.; and Haines, D. M. (The Laboratories, J. Lyons and Co., Ltd., Kensington, London, W. 14)
The Analyst 85, 341-346 (May 1960)

Reverse-phase partition chromatography was used to separate butylated hydroxyanisole and the gallate esters from fat. The gallate esters were determined colorimetrically after reaction with ferrous tartrate, whereas butylated hydroxyanisole was determined after reaction with 2:6-dichloroquinone chloroimide. Ultraviolet absorption was used in determination of the concentration of strongly alkaline solutions of butylated hydroxytoluene that had been dissolved.

8.59 BIOCHEMICAL STUDIES OF THE ASCIDIAN, CYNTHIA RORETZI v. DRASCHE II. ISOLATION OF n-OCTANOL, n-DECENOL, AND n-DECADIENOL

Suzuki, Yoshio (Tohoku University, Sendai, Japan)
Tohoku Journal of Agriculture Research 10, 65-69 (March 1959)

This was the first reported occurrence of n-octanol and n-decadienol in an ascidian. n-Decadienol, which was named cynthianol by the author, has not been found elsewhere in nature to date.

8.59 LABILE TRIMETHYLAMINE COMPOUNDS OF MARINE ANIMALS

Audoinot, Renee and Kahane, Ernest (Fac. sci., Montpellier, France)
Chemical Abstracts 53, 10575e (June 10, 1959)

8.59 ACETYLCHOLINESTERASE IN GOLDFISH MUSCLE. STUDIES ON SOME SUBSTRATES AND INHIBITORS

Lundin, S. J. (Research Inst. Natl. Defence, Sundbyberg, Swed.)
Chemical Abstracts 53, 15131h (August 25, 1959)

8.59 UREA AND OSMOTIC PROPERTIES OF TAPEWORMS FROM ELASMOBRANCHS

Read, Clark P.; Douglas, Lee T.; and Simmons, John E. (Marine Biol. Lab., Woods Hole, Mass.)
Chemical Abstracts 53, 15386a (August 25, 1959)

8.7 UNITED STATES STANDARDS FOR GRADES OF FROZEN RAW BREADED FISH PORTIONS

Bennett, Elmer F.
Federal Register 25, No. 40, 1717-1719 (February 27, 1960)

8.7 UNITED STATES STANDARDS FOR GRADES OF FROZEN COD FILLETS

Bennett, Elmer F.
Federal Register 25, No. 40, 1720-1722 (February 27, 1960)

8.7 PROPOSED RULE MAKING: FROZEN SALMON STEAKS, UNITED STATES STANDARDS FOR GRADES

Bennett, Elmer F.
Federal Register 25, No. 40, 1730 (February 27, 1960)

The Director of the Bureau of Commercial Fisheries proposes to recommend to the Secretary of the Interior the adoption of the regulations set forth in this publication to establish grade standards for frozen salmon steaks.

INT.DUP..D.C.60- 77938

United States
Department of the Interior
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Bureau of Commercial Fisheries
Washington 25, D. C.

Official Business